PREPARED FOR:
PACCAR Inc

BY:
Shannon & Wilson
400 N. 34th Street, Suite 100
Seattle, WA 98103

(206) 632-8020
www.shannonwilson.com

HEALTH AND SAFETY PLAN

Compliance Monitoring Plan

8801 EAST MARGINAL WAY S TUKWILA, WASHINGTON

Agreed Order No 6069

SHANNON & WILSON

March 15, 2021

Shannon & Wilson No: 21-1-12567-024

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SITE HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

Shannon & Wilson

I understand and agree to abide by the provisions as detailed in the Shannon & Wilson's Health and Safety Plan detailed in this document. Failure to comply with these provisions may lead to disciplinary action, which may include dismissal from the work site and termination of employment.

We, the undersigned, have reviewed this plan, are familiar with its contents, and agree to abide by all the provisions herein:

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ACRONYMS

CFR	Code of Federal Regulations
CMP	Compliance Monitoring Plan
CRZ	Contamination Reduction Zone
dBA	decibels
DOSH	Washington State Department of Occupational Safety and Health
EZ	Exclusion Zone
HASP	Health and Safety Plan
HRI	Heat-Related Illness
IDW	investigation-derived waste
LNAPL	light nonaqueous phase liquid
mg/m^3	milligrams per meter cubed
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
SSO	Site Safety Officer
SZ	Support Zone
the Site	8801 East Marginal Way South, Tukwila, Washington
VOCs	volatile organic compounds
WAC	Washington Administrative Code

HEALTH AND SAFETY CONTACT INFORMATION

SITE LOCATION:	8801 East Marginal Way South Tukwila, WA
PROJECT MANAGER:	Meg Strong, Shannon & Wilson (206) 695-6787 (office) (b) (6) (mobile)
HEALTH AND SAFETY MANAGER:	Mindy Buxton, Shannon & Wilson (206) 695-6813 (office) (b) (6) (mobile)
SITE SAFETY OFFICER:	Christian Canfield, Shannon & Wilson (206) 695-6716 (office) (b) (6) (mobile)
FACILITY REPRESENTATIVE:	Ms. Bridget Fisher (b) (6) (mobile)
NEAREST WALK-IN CLINIC:	U.S. HealthWorks 3223 1st Avenue South, Seattle, WA (206) 624-3651
NEAREST HOSPITAL:	Harborview Medical Center 325 9th Avenue, Seattle, WA (206) 744-3000

1 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared to address health and safety considerations for the proposed activities outlined within the Compliance Monitoring Plan (CMP). This HASP and a Sampling and Analysis Plan are included as appendices to the CMP.

This HASP addresses the conduct of Shannon & Wilson's employees. Contractors procured by Shannon & Wilson for the project will provide their own HASP, which will be reviewed by us for compliance with site requirements.

The proposed activities are to be conducted at the facility located at 8801 East Marginal Way South, Tukwila, Washington (the Site). A Site Map is provided as Attachment A. The site is owned and operated by CenterPoint. The activities are being completed on behalf of PACCAR Inc.

2 SCOPE OF WORK

The scope of work, as outlined in the CMP, consists of remedial excavations, well decommissioning, well installation, groundwater sampling, remedial injections, and sub-slab vapor sampling.

This HASP will cover activities outlined within the CMP. This HASP will be revised to address the specific health and safety concerns related to activities outside the scope of work. Such work cannot be initiated until a revised HASP has been updated and approved.

3 SITE CHARACTERISTICS

The upland portion of the 8801 site occupies 24.30 acres on the east bank of the Lower Duwamish Waterway and is relatively flat, with a ground surface elevation of approximately 20 feet above mean sea level.

CenterPoint plans to redevelop the property. The redevelopment is slated for late 2019 through 2021. The redevelopment plans include demolition of the existing buildings except the smaller warehouse on the west end of the 8801 property which houses the aboveground infrastructure for the existing air sparging/soil vapor extraction system. Redevelopment plans include construction of an approximately 414,400-square-foot building for industrial use and trailer storage. The design of the building includes importing fill to raise the floor level approximately 4 feet above existing grade to allow direct truck loading.

4 PERSONNEL ASSIGNMENTS

4.1 Project Manager (PM)

The PM is responsible for the overall management of the project, including safety, quality, and production. He/She is responsible to schedule, review, certify, and manage all submittals, including those of subcontractors, fabricators, suppliers, and purchasing agents, with attention to safety and health aspects of performance and procurement. The PM oversees the environmental/industrial hygiene and atmospheric testing performed by field personnel and outside testing laboratories. The PM has full authority to stop work due to health and safety deficiencies.

4.2 Site Safety Officer (SSO)

The SSO will be responsible for implementation of the HASP during all investigation activities. The SSO will ensure that field teams utilize all safety practices, and that during emergency situations, appropriate procedures are immediately and effectively initiated. He/She will also be responsible for the control of specific field operations and all related activities such as personnel decontamination, monitoring of worker heat or cold stress, distribution of safety equipment, and conformance with all other procedures established by the HASP. The SSO has full stop-work authority due to safety and health deficiencies. The SSO's primary responsibility is to provide the appropriate monitoring to ensure the safe conduct of field operations.

4.3 Field Team Members

The field team members (field personnel) are responsible for conducting their assigned work duties in a safe and healthy manner and following the procedures established in the site-specific HASP. Field personnel have full authority to stop work due to safety and health deficiencies.

5 TRAINING REQUIREMENTS

All personnel conducting site work involving intrusive activities where the potential exists for exposure to contaminated soils or groundwater (drilling, sampling, excavation, etc.) shall have completed 40 hours of classroom-style health and safety training and three days of on-site training, as required by the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120 and Washington Administrative Code (WAC) 296-843.

All supervisory personnel, including the Health and Safety Manager, will have received an additional eight hours of training as required for management of personnel and activities associated with hazardous waste site activities covering at a minimum the following topics: the employer's health and safety program, personal protective equipment (PPE) program, spill containment program, and health hazard monitoring procedures and techniques. Employees will also receive a minimum of eight hours' refresher training annually. Copies of current training certificates will be maintained in the Shannon & Wilson Corporate office.

5.1 Site-Specific Training

All on-site personnel will complete a site-specific initial training session or briefing, conducted by the SSO, prior to commencement of the project and/or entering the site. The training session should be of sufficient duration to ensure that they are familiar with site-specific hazards, protective equipment, site control, decontamination, emergency procedures, and security procedures. Elements to be covered as part of the site-specific training include:

- Personnel responsibilities;
- Site hazards and controls;
- Use of PPE;
- Action levels for upgrading/downgrading levels of PPE;
- Work practices by which the employee can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazards;
- Site-specific hazardous procedures (i.e., intrusive activities, etc.);
- Emergency information, including local emergency response team phone numbers, route to nearest hospital, and emergency response procedures; and
- Content and implementation of the HASP.

All training will be documented as to the contents of the training and personnel in attendance and kept in the project files.

5.2 Daily Safety Meeting

In addition to the initial site briefing conducted at the commencement of the project, supplemental brief safety meetings shall be conducted by the SSO to discuss potential health and safety hazards associated with upcoming tasks, and necessary precautions to be taken.

Daily safety meetings will be completed prior to the beginning of each day's work and documented on a Daily Safety Meeting Log, provided as Attachment B.

5.3 Visitor Training

All visitors to the site will be required to check in with the PM/SSO. Depending on the purpose of their visit, the visitors will receive an orientation briefing from the PM/SSO, which will include site-specific hazards, ways to protect themselves from these hazards, locations of first aid and emergency equipment, and the emergency response procedures.

6 MEDICAL SURVEILLANCE

All field personnel must meet the medical monitoring requirements of 29 CFR 1910.120. The regulations require that employers implement a medical monitoring program consistent with paragraph (f) of this standard, which states that a medical examination will be completed for each employee prior to employment, annually thereafter (minimum), and as a follow-up to injuries or overexposures, and upon termination of their employment with the company. Employees who must receive medical examinations include those who wear a respirator for 30 or more days a year, and those who are or may be exposed to hazardous substances at or above permissible exposure levels, regardless of respirator use, for 30 days or more a year.

Any personnel injured or suspected of being injured as a result of an uncontrolled release of a hazardous substance or energy, or other emergency situation, will be given a medical evaluation as soon as possible thereafter.

Shannon & Wilson's employee medical records are available upon request from the Human Resources Manager, with the employee's permission. The SSO will confirm medical certification to work and wear respiratory protection and keep a copy of the certification (containing certifying physician's signature) in the personnel files in the Seattle office. Physical examination forms shall be released only with the individual employee's approval.

7 HAZARD ASSESSMENT AND RISK ANALYSIS

A summary of the activity hazard analysis is provided as

Exhibit 7-1.

Exhibit 7-1: Activity Hazard Analyses

	Activity	Potential Hazards	Recommended Controls
1.	Driving to, on, and from the site	Vehicle breakdown/flat tire Getting lost Rough terrain Accident Severe weather	Equip vehicle with emergency supplies/spare tire. Have a map with directions to the site. Wear appropriate clothing for the weather. Wear seat belts at all times while vehicle is in motion Only licensed drivers allowed to operate vehicles. Obey all traffic rules. Do not drive over large holes, rocks, or down steep embankments. Avoid driving in severe weather, if possible. If not, reduce speed and turn on headlights.
2.	Site reconnaissance	Severe weather Slips, trips, and falls Contact with dead animals Bites from snakes or insects	Wear appropriate clothing for the weather. Avoid site reconnaissance during severe weather conditions. Stop work if potential for thunderstorms or winter storms. Be aware of surroundings and use caution when moving around the site. Stay away from snake or insect breeding habitats. Wear proper PPE and insect repellant. Stay away from animal carcasses unless wearing proper PPE. Use proper hygiene.
3.	Vegetation clearing	Contact with rotating machinery and sharp blades from scythe Contact with potentially contaminated soil Noise Fires and/or explosions Electrical hazards Trips and falls	Personnel should not wear rings, loose-fitting clothes, straps, draw strings, etc. Safety guard for "weed-eater" should be in place. Emergency shut-off should be inspected daily to ensure proper functioning. Site personnel must wear appropriate PPE, including heavy gloves and safety glasses to protect from blackberries. Hearing protection must be used. Fuel will be stored in approved containers. A 2A10BC fire extinguisher must be in the vehicle. A first aid kit must be at the site. Wear appropriate clothing for the weather. Stop work if potential for thunderstorms or winter storms. Be aware of surroundings and use caution when moving around the site. Site personnel will exercise care when working next to a hill slope.
4.	Collect surface and subsurface soil samples	Contact with potentially contaminated soil Inhalation of volatile gases Bites from insects Contact with dead animals Severe weather Back injury	Wear appropriate PPE, including nitrile gloves, work clothes, and safety glasses. Conduct air monitoring and remain upwind whenever possible. Wear appropriate clothing for the weather. Stop work if potential for thunderstorms or winter storms. Be aware of surroundings and use caution when moving around the site. Stay away from snake or insect breeding habitats. Wear proper PPE and insect repellant. Stay away from animal carcasses unless wearing proper PPE. Use proper hygiene. Use proper lifting techniques or request assistance.

	Activity	Potential Hazards	Recommended Controls
5.	Collect water samples	Contact with potentially contaminated water Inhalation of volatile gases Bites from insects Contact with dead animals Severe weather Potential fire or explosion hazards	Wear appropriate PPE, including nitrile gloves, work clothes, and safety glasses. Conduct air monitoring and remain upwind whenever possible. Wear appropriate clothing for the weather. Stop work if potential for thunderstorms or winter storms. Be aware of surroundings and use caution when moving around the site. Stay away from snake or insect breeding habitats. Wear proper PPE and insect repellant. Stay away from animal carcasses unless wearing proper PPE. Use proper hygiene. When using the generator, do not stage it in an area of dry vegetation or if elevated PID measurements are being detected.
6.	Decontaminate equipment	Contact with potentially contaminated decontamination solutions	Wear appropriate PPE, including nitrile gloves, work clothes, and safety glasses.
7.	Field screening of samples	Contact with potentially contaminated soil or sediment	Wear appropriate PPE, including nitrile gloves, work clothes, and safety glasses.
8.	Sample packaging	Back strain	When possible, two people will handle heavy sample coolers, or multiple coolers containing fewer sample containers will be used.
9.	Handle investigation-derived waste drums	Back strain	Use proper drum handling procedures and equipment.
10.	Mobilize drill rig	General health and safety Trips and falls Contact with equipment Traffic control zones	Ensure that subcontractor employees have been informed of the contents of the site-specific Health and Safety Plan. Communicate drilling hazards to all field personnel. Assure that qualified drillers are operating rig. Assure that drillers have a written rig inspection program. Assure that drillers have another required written program. Provide adequate storage for tools, augers, pipe, etc. Keep platforms free of tools, debris, and slick substances such as mud and grease. Drillers must not climb the mast/derrick unless they wear fall protection. Keep clear from the rear and sides of the rig or equipment (except drillers). Lower and level the jack pods before raising the mast/derrick. Lock the mast/derrick into place before drilling. Make sure traffic control zones are established and personnel are aware of perimeter distances.

Activity	Potential Hazards	Recommended Controls
11. Perform drilling operations	Contact with rotating machinery, cables, pulleys, etc. Contact with potentially contaminated soil, groundwater, or free product Noise Fires and/or explosions Electrical hazards Trips and falls	Drillers should not wear rings, loose-fitting clothes, straps, draw strings, etc. Broken, cut, or frayed wires on the rig should be replaced. Pulleys must operate freely, and cable guards must be in place. Pulleys will be proper size for cable diameter. Emergency shut-off should be inspected daily to ensure proper functioning. Site personnel must wear appropriate PPE, including nitrile gloves and safety glasses. Monitor breathing and perimeter zones with a PID. Remain upwind of activities. Hearing protection must be used. Fuel will be stored in approved containers. A 2A10BC fire extinguisher must be on the rig. A first aid kit must be at the site. All utilities must be located prior to drilling operations. In the event of an electrical storm, drilling operations must be shut down and workers must move to a safe location. Mast/derrick must be kept a minimum of 15 feet from overhead power lines at all times. Borings will be placed a minimum of 2 feet from hill slope. Site personnel will exercise care when working next to a hill slope.

NOTE:
PID = photoionization detector

Hazards associated with this HASP can be grouped into three main categories: (a) chemical, (b) physical, and (c) biological.

7.1 Chemical Hazards

Chemical hazards identified for the subject property in air may include the following:

- Metals,
- Petroleum hydrocarbons,
- Volatile organic compounds (VOCs),
- Semi-VOCs, and
- Polychlorinated biphenyls (PCBs).

The primary routes of exposure for these contaminants are the inhalation of vapors, gases, or particulate; inhalation of contaminated soil particulate; direct skin contact with contaminated media; or the accidental ingestion of contaminated soil or water. Use of proper PPE, awareness, and air monitoring, when necessary, will reduce the potential for

exposure. Periodic evaluation of the hazards associated with different work tasks and the determination for any changes will be made by the SSO, with concurrence from the PM.

An assessment of the chemical hazards as well as a discussion of symptoms are provided in Exhibit 7-2. Safety Data Sheets are provided in Attachment C. Air monitoring and respiratory protection are discussed within Section 9.1.

Exhibit 7-2: Chemical Hazards Assessment

Chemical Hazard	TLV/PEL	Route of Exposure	Signs and Symptoms
Petroleum Hydrocarbons (based on gasoline)	PEL-TWA = 300 ppm STEL = 500 ppm	Eye, Skin, Inhalation, Ingestion	Irritated eyes, skin, and mucous membranes; dermatitis; headache, fainting, blurred vision, dizziness, slurred speech, confusion, and convulsions; chemical pneumonia (aspiration); possible liver, kidney damage; carcinogen.
Polychlorinated Biphenyls	TLV = 0.5 mg/m^3 (skin) STEL = 5 mg/m^3	Inhalation, Skin, Ingestion, Eye	Skin and eye irritation on contact. Chloracne. Liver damage. Possible carcinogen. Headaches or numbness may occur if ingested.
Heavy Metals	TLV varies depending on the metal present	Skin, Ingestion, Eye	Skin and eye irritation, dermatitis, headache, and nausea. Ingestion can result in liver or kidney damage.
Volatile Organic Compounds (VOCs)	TLV varies depending on the VOC present	Inhalation, Skin, Ingestion, Eye	Irritated eyes, skin, nose, respiratory system; narcosis, headache, nausea, staggered gait, fatigue; anorexia; anesthesia, central nervous system depression, dermatitis; some may be carcinogens.
Polynuclear Aromatic Hydrocarbons (PAHs)	TLV varies depending on the PAH present	Skin, Ingestion, Eye	Irritated eyes, skin, upper respiratory, mucous membranes; dermatitis, headache, bronchitis, hyper pigmentation of skin; possible liver, kidney damage; some may be carcinogens.

NOTES:

mg/m^3= milligrams per meter cubed; PEL = permissible exposure limit; ppm = parts per million (milligrams per liter [mg/L]); STEL = 15-minute short-term exposure; TLV = threshold limit value; TWA = time-weighted average

7.2 Physical Hazards

Risk of exposure to physical hazards varies from task to task and often with the time of the year. Shannon & Wilson has developed a series of standard operating procedures for these

physical hazards, which are provided within the Corporate HASP. Additional site hazard controls are discussed in Section 9.1.6. Field personnel shall follow these procedures while performing their specific work tasks. Exhibit 7-3 contains a summary of potential effects from physical hazards.

Exhibit 7-3: Physical Hazards and Effects

Physical Hazard	Effect
Noise	Hearing loss/disruption of communication
Rain/Humidity/Cold/Ice/Snow/ Lightning/Wind/Flood	Slips and falls/vehicle accident risk increase/instruments malfunction/electrocution/falling objects
Electrical	Electrical units used in wet environments
Ambient Heat	Heat rash/cramps/exhaustion/heatstroke
Cold	Hypothermia/frostbite
Heavy/Manual Lifting	Back strain/abdomen/arm/leg muscle/joint injury
Rough Terrain	Vehicle accidents/slips/trips/falls
Unsafe Structures	Electrical buildings where polychlorinated biphenyl-containing equipment may have been located
Debris and Building Materials	Slips/trips/falls/punctures/cuts/fires/biological hazards
Biological Hazards	Insects, bears, cougars, poisonous plants
Traffic	Struck by vehicle/collision
Fire or Explosion Hazard	Burns
Materials Handling	Back injury/crushing from load shifts

The physical hazards identified at this site include the following:

7.2.1 Vehicular Traffic

All vehicular traffic routes that could impact worker safety must be identified and the locations communicated to field personnel. Whenever necessary, barriers or other methods must be established to prevent injury from moving vehicles. OSHA requirements for working in or around vehicular traffic must be communicated to and followed by all personnel. Safe practices for working within facilities with heavy vehicular traffic are discussed in more detail within Section 9.1.8.

7.2.2 Slips, Trips, and Falls

Slips, trips, and falls are of concern while working, especially in wet conditions. Personnel must be aware of their surroundings while moving about the site. Pathways and work areas must be kept free of debris and supplies to prevent unsafe walking and working conditions. Changes in elevation such as ruts, holes, broken pavement, or berms should be

pointed out to all field personnel. If possible, potential slip, trip, and fall areas should be marked with bright flagging or a similar type of marker.

When water is used during any of the work tasks, care must be taken to avoid creating muddy or slippery conditions. If slippery conditions are unavoidable, barriers and warning signs must be used to warn of these dangers. Additional strategies to minimize the occurrence of slips, trips, and falls are provided in Section 9.1.9.

7.2.3 Mechanical and Heavy Equipment Operations

Extreme caution must be taken by all personnel working around mechanical equipment, pumps, and heavy equipment such as an excavator or drill rig. Only authorized personnel should be allowed in the vicinity of such equipment. All personnel must avoid standing within the turning radius of the equipment or below any suspended load. Loose clothing, jewelry, long hair, or other items that have the potential to come in contact with rotating/operating equipment are prohibited. Job sites must be kept as clean and orderly as possible to prevent unsafe walking and working conditions.

When water is used, care must be taken to avoid creating muddy or slippery conditions. If slippery conditions are unavoidable, barriers and warning signs must be used to warn personnel of these dangers.

All equipment must be maintained in good working order and be operated in a safe manner. Heavy equipment must have audible back-up alarms, rollover protection, seatbelts, and be equipped with a fire extinguisher. Shannon & Wilson personnel shall not work near equipment they judge to be unsafe due to deterioration, missing parts, obvious defects, or improper operation.

7.2.4 Electrical Hazards

OSHA regulations require that employees who may be exposed to or required to work near electrical equipment be trained to recognize the associated hazards and use the appropriate control methods. Field personnel that will be required to perform such tasks will be properly trained in accordance with OSHA regulations prior to performing their tasks.

In addition, the following guidelines will be followed by all personnel while they are on site. All extension cords used for portable tools or other equipment must be designated for hard or extra usage and be three-wire pronged. All 120-volt, single-phase 15- and 20-ampere receptacle outlets located in areas of moisture or where water contact may occur must be equipped with a ground-fault circuit interrupter. Temporary lighting lamps for general

illumination must be protected from accidental breakage and metal case sockets must be grounded.

7.2.5 Heat Stress

Heat stress at work can cause physical discomfort, loss of efficiency and attention to safety, and personal injury. Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. The type of clothing worn must be considered. Prior heat injury predisposes an individual to additional injury.

The fluid loss and dehydration resulting from physical activity puts outdoor laborers at particular risk. Certain medications predispose individuals to heat stress, such as drugs that alter sweat production (antihistamines, anti-psychotics, antidepressants) or interfere with the body's ability to regulate temperature. Persons with heart or circulatory diseases or those who are on low-salt diets should consult with their physicians prior to working in hot environments.

It is difficult to predict just who will be affected and when, because individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature. Radiant heat, air movement, conduction, and relative humidity all affect an individual's response to heat.

All personnel must be instructed on the symptoms of the primary heat-related disorders and how to minimize their chances of becoming affected by them. These disorders, their symptoms, and first-aid measures are briefly outlined below:

- Fainting (Heat Syncope): Victims usually recover quickly after a brief period of lying down. Moving around, rather than standing still, will usually reduce the possibility of fainting.
- Heat Rash: Decreased ability to tolerate heat, raised red vesicle on affected areas, and clothes that chafe. Maintain good personal hygiene and use drying powders or lotions.
- Heat Cramps: Muscle spasms and pain in the extremities and abdomen. Rest in cool area and drink plenty of fluids. If pain persists, seek medical attention.
- Heat Exhaustion: Shallow breathing; pale, cool, moist, clammy skin; profuse sweating; dizziness; lassitude; and fainting. Rest in a cool area and drink plenty of fluids. Get medical attention prior to returning to work.
- Heat Stroke: Red, hot, dry skin; no perspiration; nausea; dizziness; confusion; strong rapid pulse; coma. Cool victim immediately with cool or cold water. Seek immediate medical attention.

At a minimum, personnel wearing non-breathable clothing at temperatures greater than 70 degrees Fahrenheit (F) should take a break every one to two hours and drink plenty of fluids. The intake of an average of one quart of fluids per hour is recommended. A cool or shaded rest area should be provided. Detailed operating procedures and guidelines to prevent heat-related disorders are provided in Section 9.1.10 of this plan.

7.2.6 Cold Stress

Field personnel will be instructed on the signs and symptoms and the prevention of cold-related disorders prior to performing specific work tasks. The two major effects of cold stress are frostbite and hypothermia. These disorders, their symptoms, and first-aid measures are outlined briefly below:

- Frostnip: Occurs when the face or extremities are exposed to a cold wind, causing the skin to turn white. Frostnip is considered a minor condition with no permanent damage, as long as the human tissue is warmed up in time. If not, the condition can progress to frostbite.
- Frostbite: Sudden blanching of the skin progressing to skin with a waxy or white appearance that is firm to the touch, but the tissue beneath the skin is resilient to the touch.
- Hypothermia: The symptoms of systematic hypothermia are exhibited as follows: (a) shivering; (b) apathy, listlessness, and (sometimes) rapid cooling of the body to less than 90 degrees F; (c) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; (d) freezing of the extremities; and (e) death.
- Trench Foot: Swelling of the foot caused by long continuous exposure to cold without freezing, combined with persistent dampness or immersion in water. Edema (swelling), tingling, itching, and severe pain occurs, followed by blistering, necrotic tissue, and ulcerations.
- Chilblains: Similar symptoms as trench foot, except that other areas of the body are impacted. The cold exposure damages capillary beds in the skin, which in turn can cause redness, itching, blisters, and inflammation.
- Raynaud's Phenomenon: The abnormal constriction of the blood vessels of the finger on exposure to cold temperatures, resulting in blanching of the fingertips. Numbness, itching, tingling, or a burning sensation may occur during related attacks. The disease is also associated with the use of vibrating hand tools in a condition sometimes called White Finger Disease. Persistent cold sensitivity, ulceration, and amputations can occur in severe cases.

Personnel will monitor themselves and other team members for signs of cold stress. If temperatures fall below 20 degrees F, as measured by the wind chill index, thermal clothing may be required. Field activities will be curtailed if equivalent wind chill temperatures are

less than zero degrees F unless operations are of an emergency nature. Section 9.1.11 of this plan provides detailed operating procedures and guidelines for working in cold temperature extremes.

7.2.7 Noise

Heavy equipment or operating machinery may produce noise levels that exceed 85 decibels (dBA) scale for personnel working in or around these areas. Thus, hearing protection must be worn by personnel exposed to noise levels of 85 dBA or greater. Noise measurements, if conducted, should be performed with sound level meters in slow response mode, or with noise dosimeters having a beginning collection point established at 80 dBA. A general guideline to follow is if a conversation cannot be held with a person 4 feet from you without raising your voice, the noise levels are too high and hearing protection should be worn. Anyone within a 20-foot radius of heavy equipment or machinery in operation will wear hearing protection.

7.2.8 Heavy Lifting

The use of some sampling equipment involves heavy lifting. To assure personnel safety, the following lifting guidelines will be employed at the site:

- If available, use mechanical equipment to move heavy objects.
- If possible, use two individuals to lift heavy objects, such as sample coolers that are filled with samples.
- Establish steady footing when lifting the load.
- Spread feet no wider than shoulder width when lifting.
- Use only one person to give commands when conducting team-lifting activities.

Back injury prevention is discussed in more detail within Section 9.1.12.

7.2.9 Unsafe Structures

As part of the fieldwork, personnel may enter site structures to collect samples. Because the poor condition of some structures, prior to entering any structure, field personnel will perform a cursory evaluation of the structure's exterior to determine if the building is safe to enter. Personnel will not enter any structure that is deemed to be unsafe.

7.2.10 Confined Spaces

OSHA defines a confined space as an area that is large enough for an employee to enter fully, not designed for continuous occupancy, and has a limited or restricted means of entry or exit. Confined spaces may exist at the worksite. Field personnel will inspect their work

area prior to entering to determine the presence of confined spaces. Field personnel will not enter any confined spaces.

7.2.11 Drowning Hazard

Personnel may be required to work near or over deep bodies of water. Personnel must be aware of their surroundings at all times in order to avoid the hazards involved with drowning. Field personnel will perform a cursory inspection of the work site prior to commencing work in order to determine the need for additional controls associated with this hazard. Safe practices for working near or over water are discussed in more detail within Section 9.1.13.

7.3 Biological Hazards

The plant, animal, and/or microbial hazards most likely to be encountered by field personnel include animal bites, insect stings, or contact with irritant plants. Stinging insects, primarily bees and wasps, are prevalent during the warmer months. Stings are usually more of a nuisance than an immediate danger for most people, with the results of being stung including localized swelling, itching, and minor pain. The risk to these hazards will vary depending on the time of year and specific task performed.

8 SITE CONTROL

The purpose of site control is to minimize the health and safety risks to field personnel and the general public by means of establishing work zones and control procedures. Due to the nature and the anticipated chemicals of potential concern that may be encountered during the investigation, airborne exposures to lead is to be monitored. The establishment of the three work zones as described by OSHA and U.S. Environmental Protection Agency hazardous waste regulations does not appear warranted, except as discussed within Section 12. Since field personnel will wear disposable PPE while they are performing the general reconnaissance and sampling activities, decontamination stations will not be required unless non-disposable equipment or tools will be used in support of these activities. Necessary first-aid equipment will be located within the support vehicle. This area (Support Zone) is considered to be uncontaminated; thus, personnel shall remove any PPE that has come into contact with hazardous waste or materials prior to entering this zone.

While conducting fieldwork, field personnel will identify an immediate work zone around their work area. Depending on the location and available room, this zone may be demarcated with tape or cones.

8.1 Communications

A critical element to ensure site control and safety to both on-site and field personnel will be open-line communications. The written and visual symbols may include:

- Written notification regarding schedules and activities to be conducted,
- Hand signals between work crews,
- Visual/physical barriers notifying personnel of areas of hazards, and
- Security fencing.

The audible communications for field personnel and between on-site and field personnel will include:

- Telephone, and
- Air horn.

8.2 Buddy System

When conditions present a risk to personnel (both physical and chemical), the buddy system will be implemented. A buddy system requires two people to work as a team, each looking out for the other. Buddies must maintain continuous line-of-sight contact with one another and can physically assist should rescue be necessary.

9 SAFETY PRACTICES AND HAZARD CONTROLS

General worker safety gear, such as steel-toed boots, hardhat, hearing protection, and safety glasses or goggles, will be worn at all times by personnel working around heavy equipment. Additional PPE (gloves, neoprene boots, etc.) shall be available for emergency use or for use on work tasks where this level of PPE has been selected for personnel safety.

Eating, drinking, smoking, and horseplay shall be strictly prohibited inside the Exclusion Zone (EZ). Inspections shall be made at the discretion of the SSO. Inspections will be conducted of all emergency response equipment, such as eyewash and first aid kits, and to ensure that fire extinguishers are available for use. Working upwind from wells helps to avoid exposure to vapors and contaminated dust. Intrinsically safe portable fans may be deployed if necessary.

Some activities require special safety considerations compared to routine tasks, such as vegetation clearing, handling of hazardous materials, and working over water. These tasks

shall be performed in accordance with this HASP and the applicable regulatory requirements.

Washing facilities will be established on site or near the site. All personnel shall be informed of the location of these facilities. If necessary, mobile washing facilities will be established in the support vehicle and will consist of water, soap, means of drying, and receptacles for waste. An adequate supply of drinking water will be available near work areas. Water coolers or water bottles will be clearly marked as to their contents. Toilet facilities are available nearby.

Field operations shall be conducted in accordance with the minimum safety practices described below required for all Shannon & Wilson employees on all projects.

9.1 Chemical Hazards

9.1.1 General Practices for Hazardous Waste Sites

- Shannon & Wilson field personnel are to be thoroughly briefed on the anticipated hazards, equipment requirements, safety practices, emergency procedures, and communications methods, both initially and in daily briefings.
- At sites with known or suspected contamination, appropriate work areas for field personnel support, contaminant reduction, and exclusion will be designated and maintained.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increase the probability of hand-to-mouth transfer and ingestion of materials is prohibited in any area where the possibility of contamination exists.
- Hands must be thoroughly washed when leaving a contaminated or suspected contaminated area before eating, drinking, or any other activities.
- Contaminated protective equipment shall not be removed from the work area until it has been properly decontaminated or containerized on site.
- Avoid activities that may cause dust. Removal of materials from protective clothing or equipment by blowing, shaking, or any means that may disperse materials into the air is prohibited.
- All field personnel will, whenever possible, remain upwind of drilling rigs, open excavations, boreholes, etc.
- Field personnel are specifically prohibited from entering into excavations, trenches, or other confined spaces deeper than 4 feet. Unattended boreholes must be properly covered or otherwise protected.

- When collecting LNAPL samples, Tyvek overalls and boot covers will be used as a protective outer layer. If the LNAPL damages the Tyvek overall, a higher grade overall such as Saranex will be used.

9.1.2 Personnel Decontamination

Decontamination requirements will be established prior to site work on a case-by-case basis. The SSO will be responsible for determining these requirements.

Direct contact with pure contaminants is not anticipated. Instead, a more likely scenario is physical contact with materials such as decontamination water used for cleaning sampling supplies. Disposal PPE will be worn by field personnel performing general field investigation and decontamination activities. For protection, simple personnel decontamination will be performed near the work area using the following steps:

Step 1: Remove outer boot covers or wipe down boots.
Step 2: Remove hardhat and outer coveralls or Tyvek and wipe clean.
Step 3: Remove gloves.
Step 4: Depart the work area.
Step 5: Wash hands and face before drinking, eating, or smoking.

Because gross contamination is not anticipated, all disposable PPE shall be placed into heavy-duty plastic bags and disposed of with the general refuse. If it is determined that a location has the potential to be or is suspected to be heavily contaminated such that the establishment of three zones is required based on the hazards present, all personnel and portable equipment used in the work zone shall be subject to a thorough decontamination process. All reusable boots and gloves will be decontaminated using soap and water solution and scrub brushes, or simple removal and disposal, if the PPE is disposable. All wastewater generated during decontamination procedures will be stored on site in 55-gallon drums for subsequent disposal pending the associated analytical results. All disposable PPE will be disposed of in a trash bag. If necessary, disposal of decontamination wastes will be through certified disposal transporters/operators per the waste characteristics.

9.1.3 Sampling Equipment Decontamination

Before daily use, all portable monitoring equipment will be bagged or contained in such a way as to allow for simple decontamination procedures. Exposed parts shall be cleaned with wet cloths and/or alcohol wipes.

Sampling equipment will be decontaminated. The following procedures will be used to decontaminate equipment:

- Dislodge gross contamination from sampling utensils.

- Scrub with appropriate brush in a phosphate-free detergent.
- Rinse with tap water.
- Rinse with deionized water.
- Rinse with methyl alcohol (only if required based on contaminants present).
- Air dry.

9.1.4 Air Monitoring

Air monitoring will take place using a photoionization detector (PID) to detect VOCs and air monitoring cassettes to monitor lead.

9.1.4.1 Lead Air Monitoring

Air monitoring to sample for lead will take place during remedial excavation activities at Area 5. When soil containing lead is disturbed during excavation activities, an evaluation must be made as to whether or not workers are exposed to concentrations in air in excess of the action level of 0.03 milligram per cubic meter (mg/m^3). If the action level is exceeded, requirements for training, medical monitoring, and air sampling are triggered. If the permissible exposure level of 0.05 mg/m^3 is exceeded, additional requirements must be met, including use of respiratory protection equipment. Information pertaining to worker safety and health is in OSHA 29 CFR 1926.62.

A minimum of one employee per each job classification per day of excavation will wear a personal sampling pump and cassette. The sample shall be representative of one 8-hour shift. Samples shall be submitted on a rushed turnaround time to an analytical laboratory for results. If the action level is exceeded, personal protective equipment and work practices shall be reevaluated.

Perimeter air monitoring will take place downwind of the remedial excavations. Similarly to personnel air monitoring, samples will be representative of one 8-hour work day. Samples shall be submitted on a rushed turnaround time to an analytical laboratory for results.

Lead samples will be analyzed by NVL Laboratories in Seattle, Washington. Samples will be analyzed by NIOSH 7082 Flame Atomic Absorption method.

9.1.4.2 Volatile Organic Compound (VOC) Air Monitoring

Air monitoring using a PID will be conducted when well monument lids are opened, an odor is detected, during excavations, or LNAPL is present. The instrument will provide real-time measurements of airborne contaminant concentrations and provide the site

workers with an additional level of protection against exposure to contaminants. The meter will be calibrated in accordance with the manufacturer's guidelines on a daily basis prior to the start of that day's field activities.

An action level of 5.0 parts per million (ppm) sustained for one minute in the worker's breathing zone has been established for this project. If PID readings exceed this established action level, the area may have to be evacuated for a period of time to allow levels to return to below action levels, alternative engineering controls may be implemented to lower the levels such as keeping all field personnel upwind of the borehole, or an upgrade to Modified Level C PPE will be required, which includes the use of respirators. If sustained elevated PID readings are obtained during the fieldwork, personnel will evaluate whether they are due to an external source such as a generator or vehicle or if the elevated readings are due to the presence of site contamination.

9.1.5 Respiratory Protection

- The Shannon & Wilson Respiratory Protection Program will be followed whenever a respirator is required.
- Field personnel must use the "buddy system" when wearing any respiratory protective devices. Communications between members must be maintained at all times. Emergency communications shall be prearranged in case unexpected situations arise. Visual contact must be maintained between pairs on site, and team members should stay close enough to assist each other in the event of an emergency.
- Personnel should be cautioned to inform each other of subjective symptoms of chemical exposure such as headache, dizziness, nausea, and irritation of the respiratory tract.
- No excessive facial hair that interferes with a satisfactory fit of the facepiece-to-face seal will be allowed on personnel required to wear respiratory protective equipment.
- The selection, use, and maintenance of respiratory protective equipment shall meet the requirements of established Shannon & Wilson procedures, recognized consensus standards (American Industrial Hygiene Association, American National Standards Institute, and National Institute for Occupational Safety and Health), and shall comply with the requirements set forth in 29 CFR 1910.134 and WAC 296-841.

9.1.6 Physical Hazards

9.1.7 Safe Driving

Operators of vehicles on company business must:

- Evaluate conditions of the vehicle and observe deficiencies of the vehicle before commencing operation.

- Driver must be in possession of a valid driver's license.
- Wear seat belts/available safety restraint systems in all vehicles.
- Drive defensively, be courteous, and obey all traffic rules and regulations.
- Do not exceed posted speed limits.
- Do not pick up hitchhikers.
- Do not use cell phones while driving.
- Under no circumstances should a Shannon & Wilson employee operate a vehicle while under the influence of intoxicating beverages, drugs, or other substances.
- Operate the vehicle at a SAFE speed in cases of inclement weather, heavy traffic, or other road hazards. Be especially aware of the hazards of black ice, particularly on bridges and overpasses.
- Remove keys and lock unattended vehicles.

All accidents involving a vehicle being operated on business, regardless of circumstances or severity, will be reported to the PM within 24 hours. It is important to note that this is done not to find fault, but to analyze specific incidents for future accident prevention.

9.1.8 Facility/Traffic

Cargo/transfer terminal sites and other work sites with high traffic flow and limited visibility present a significant hazard to Shannon & Wilson field staff. Since this is an area of extremely high risk, it is important that the following health and safety policies and procedures are followed. While visual devices are generally effective, the use of a structural barrier (such as a company vehicle) is a more effective method of protection should a vehicle driver fail to see an employee. Barriers shall be used on work sites when it is possible to do so without adversely affecting the project work or other client considerations. Employees are reminded to maintain a high degree of awareness of moving vehicles on the site. The following guidelines concerning traffic warning devices should be followed when working in traffic flow areas:

- Meet with the Facility Manager at the start of fieldwork to discuss equipment and personnel access to the work area;
- Obtain any facility-related emergency information, i.e., facility alarms, response phone numbers, evacuation areas, and special hazards;
- High-visibility vests shall be worn by employees when working around traffic flow areas. Ensure that there is a clear line of sight between approaching traffic and the work area;

- Orange cones are typically used to direct traffic flow on roadways but are not always appropriate as a flagging device on Shannon & Wilson project sites. Due to the low height, a cone can be easily overlooked, especially when a motorist is backing up. Tubular markers at least 4 feet high with flags attached at the top are more visible. Alternatively, a Type I barricade with flagging at the top may be used. One option often used with cones is to place an object on the cones that will make noise if struck by a car; and
- When two or more Shannon & Wilson employees are together on a site and a site-specific activity has a high risk of impact from vehicular traffic, one employee shall act as a look-out for the other employee performing the specific work activity.

9.1.9 Slip/Trip/Hit/Fall Hazards

Slip/trip/hit and fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot check the work area to identify hazards;
- Establish and utilize a pathway that is most free of slip and trip hazards;
- Beware of trip hazards such as wet floors, slippery surfaces, and uneven surfaces or terrain;
- Carry loads that you can see over;
- Keep work area clean and free of clutter, especially in storage rooms and walkways;
- Communicate hazards to on-site personnel;
- Secure all loose clothing and ties, and remove jewelry while around machinery;
- Report and/or remove hazards; and
- Keep a safe buffer zone between workers using equipment and tools.

9.1.10 Heat Stress

The Washington State Department of Occupational Safety and Health (DOSH) regulates heat-related illness in WAC 296-62. DOSH defined Heat-Related Illness (HRI) triggers based on the type of clothes worn, ambient temperature, and whether the work is conducted in sun or shade. Exhibit 9-1 provides trigger conditions at which provisions of the HRI rule become mandatory.

Exhibit 9-1: DOSH Heat-Related Illness Trigger Conditions

Type of Clothes Worn	Work in Direct Sun	Work in Shade
Work clothes (standard construction clothes)	89°F	96°F

Double-layer woven clothes (coveralls over work clothes)	77°F	87°F
Vapor barrier (Tyvek, etc.)	52°F	62°F

NOTE:
°F = degrees Fahrenheit

The HRI rule includes requirements for a written procedure, water on site, and training of staff and supervisors.

Written Procedures. The employer must establish, implement, and maintain written procedures to reduce to the extent feasible the risks of heat-related illness that include the following elements:

- Identification and evaluation of temperature, humidity, and other environmental factors associated with heat-related illness
- Provisions to reduce to the extent feasible the risks of heat-related illness that include the following elements:
  - The provision of rest breaks as needed to reduce to the extent feasible the risks of heat-related illness.
  - Encourage frequent consumption of water.
  - Procedures for responding to signs or symptoms of possible heat-related illness and accessing medical aid.
  - Employees are responsible for monitoring their own personal factors for heat-related illness, including ensuring they consume adequate water.

Drinking Water. Drinking water must be provided and made readily available in sufficient quantity to provide at least one quart per employee per hour. Employers may begin the shift with smaller quantities of drinking water if they have effective procedures for replenishment during the shift as needed to allow employees to drink one quart or more per hour.

Training. Training in the following topics must be provided to all employees who may be exposed to a heat-related illness hazard.

- The environmental factors that contribute to the risk of heat-related illness;
- General awareness of personal factors that may increase susceptibility to heat illness including, but not limited to, an individual's age, degree of acclimatization, medical conditions, water consumption, alcohol consumption, caffeine consumption, nicotine use, and use of prescription and nonprescription medications that affect hydration or other physiological responses to heat;
- The employer's procedures for identifying, evaluating, and controlling exposure;

- The importance of removing PPE that increases exposure to heat-related illness hazards during all breaks when feasible;
- The importance of frequent consumption of small quantities of water. One quart or more over the course of an hour may be necessary when the work environment is hot and employees may be sweating more than usual in the performance of their duties;
- The importance of acclimatization;
- The different types of heat-related illness and the common signs and symptoms of heat-related illness;
- The importance of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves, or in co-workers;
- The employer's procedures for responding to symptoms of possible heat-related illness, including how emergency medical services will be provided should they become necessary; and
- The purpose and requirements of this standard.

Prior to supervising employees who are working in conditions that may present heat-related illness hazards, supervisors must have training on the following topics:

- The procedures the supervisor is to follow to implement the HRI rule;
- The procedures the supervisor is to follow when an employee exhibits signs or symptoms consistent with possible heat-related illness, including emergency response procedures;
- Procedures for moving employees to a place where they can be reached by an emergency medical service provider, if necessary; and
- How to provide clear and precise directions to the emergency medical provider who needs to find the work site.

9.1.11 Cold Stress

To reduce adverse health effects from cold exposure, adopt the following work practices:

- Provide adequate dry insulating clothing to maintain core temperature above 98.6 degrees F to workers if work is performed in air temperature below 40 degrees F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32 degrees F or less, hands should be protected by gloves or mittens.

- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Use heated warming shelters available nearby (e.g., on-site trailer) at regular intervals, the frequency depending on the severity of the environmental exposure. When entering the heated shelter, remove the outer layer of clothing and loosen the remainder of clothing to permit heat evaporation or change to dry work clothing.
- Provide warm, sweet drinks (e.g., hot chocolate) and soups at the work site for calorie intake and fluid volume. Limit the intake of coffee because of the diuretic and circulatory effects of caffeine.
- Include the weight and bulk of clothing in estimating the required work performance and weights to be lifted by the worker.
- Implement a buddy system in which workers are responsible for observing fellow workers for early signs and symptoms of cold stress.
- Employees that are not acclimatized should not work full time in cold until they become accustomed to the working conditions and required protective clothing.

Exhibit 9-2 describes the cooling power of wind on exposed flesh. This information can be used as a guide for determining equivalent chill temperatures when the wind is present in cold environments.

Exhibit 9-2: Wind Chill Factors

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-82	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-129	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect)	**LITTLE DANGER** In less than an hour with dry skin. Maximum danger of false sense of security.				**INCREASING DANGER** Danger from freezing of exposed flesh within one minute.			**GREAT DANGER** Flesh may freeze within 30 seconds.				
Trench foot may occur at any point on this chart.												

NOTES:

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.

°F = degrees Fahrenheit; mph = miles per hour

Field personnel will observe work and warming regimen as shown in Exhibit 9-3.

Exhibit 9-3: Cold Weather Work/Warm-Up Regimen

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Maximum Work Period	Number of Breaks	Maximum Work Period	Number of Breaks	Maximum Work Period	Number of Breaks	Maximum Work Period	Number of Breaks	Maximum Work Period	Number of Breaks
-26 to -28	-15 to -19	(Norm Breaks) 1		(Norm Breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29 to –31	-20 to -24	(Norm Breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32 to –34	-25 to -29	75 min.	2	55 min.	3	40 min.	4	30 min.	5	non-emergency work should cease	
-35 to –37	-30 to -34	55 min.	3	40 min.	4	30 min.	5	non-emergency work should cease		non-emergency work should cease	
-38 to –39	-35 to -39	40 min.	4	30 min.	5	non-emergency work should cease		non-emergency work should cease		non-emergency work should cease	
-40 to –42	-40 to -44	30 min.	5	non-emergency work should cease		non-emergency work should cease		non-emergency work should cease		non-emergency work should cease	
-43 and below	-45 and below	non-emergency work should cease		non-emergency work should cease		non-emergency work should cease		non-emergency work should cease		non-emergency work should cease	

NOTES:

* Developed by the American Conference of Governmental Industrial Hygienists.
°C = degrees Celsius; °F = degrees Fahrenheit; min. = minute; mph = miles per hour

9.1.12 Back Injury Prevention

Back injuries on the job are costing employers in the U.S.A. approximately $6.5 billion annually. Eight out of ten people will suffer a back injury during their life time, either on or off the job. Many of these injuries could be prevented by adhering to the following proper lifting concepts:

- **Keep the load close to the body.** Arrange tasks so that the load will be close to the body and at a proper and safe height that will not require bending or stooping. Tighten stomach muscles to offset the force of the load.

- **Keep the load within reach.** Try to arrange tasks to eliminate handling loads below 20 inches or above 50 inches. Try to keep the lifting zone between your shoulders and the knuckles.
- **Control the load size.** Loads that extend beyond 16 inches in front of the body put excessive lifting stress on the body and should be handled by two people or lifting aids should be employed.
- **Maintain proper alignment of body.** The task should be designed so that twisting of the body is minimized or eliminated. Twisting while carrying a load increases injury potential significantly.
- **Lift with your legs.** Your leg muscles are the strongest in your body. Always bend your knees and use your leg muscles when you go toward the floor whether you have a load or not. Do not bend at your waist if it can be avoided.
- **Balance your load if possible.** An evenly balanced load is much easier and much safer to handle than an off-balance load. Grasp the object at opposite corners if possible.
- **Avoid excessive weights if possible.** Mechanical aids should be used for loads that are greater than those which can be handled safely by one person.
- **Lift in a comfortable manner.** Workers should use a lifting position that feels comfortable for them; however, they should bend their knees and keep their back as straight as possible when performing a lift. Your feet should be shoulder-width apart in order to get the best footing possible.
- **Lift smoothly and gradually.** Quick jerking lifting motions increase sudden and abrupt stress to the back. This type of aggressive movement can affect the discs, muscles, and the ligaments. A well-controlled and smooth lifting motion will reduce the likelihood of injury.
- **Most importantly, think before lifting.**

In addition to these lifting techniques, it is also important to implement the proper carrying techniques as follows:

- **Eliminate carrying where possible.** If possible, conveyors, trucks, small loaders, and other mechanical equipment should be considered. Carts and dollies should be employed when surface conditions permit. Surface conditions can be altered with plywood or other materials.
- **Use two-handed carries where possible.** Using a two-handed carry method helps to balance the load and even out the body stress.
- **Keep the load close to the body.** Keeping the load in close and lifting in as erect a position as possible helps to reduce the stress to the lower spine.

- **Keep your arms straight.** Less stress is created on the muscles and ligaments when your arms are kept straight during a carry. Contraction of the muscles will quickly increase fatigue and the possibility of an accident.
- **Balance the load.** A balanced load is similar to the two-handed carry. The load is evenly distributed across the body and the stress is also evenly shared.
- **Avoid carrying any material on stairs.** Carrying on stairs will obstruct your vision and increase the likelihood of slip and fall. The bumping of the load on your leg as you climb or descend increases the chance of an injury.
- **Reduce the weight if possible.** When the weight of the lifts is high, look for ways to reduce the weight. Use smaller containers, put less in containers, indicate fill levels, and locate lighter containers.
- **Use handles.** Make the task easier by adding handles where possible. If numerous repetitions are required, it may be possible to design a handled device to accommodate a two-handed carrying task.

In addition to these lifting and carrying techniques, it is also important to consider pushing and pulling tasks:

- **Eliminate manual pushing and pulling where possible.** Look at those tasks that are repeated often to see if they can be modified or altered in a way that reduces pushing and pulling. Consider mechanical aids, powered conveyors, gravity slides, and chutes.
- **Reduce the necessary force.** Force required is a function of weight, gravity, and friction. Look for opportunities to reduce these factors. Improved bearings, larger wheels, reduced weight, improved rolling surfaces, lubrication, and improved regular maintenance are all opportunities for reducing work force and stress.
- **Push load instead of pulling.** Studies indicate that pushing loads rather than pulling them is the safest approach. There is less stress on muscles, joints, and ligaments. As in lifting, pushing pressure should be applied firmly, but gradually. Avoid aggressive impacts.

There are also a number of guidelines to follow when addressing tasks that involve shoveling operations:

- **Choose correct shovel type.** The shovel should be appropriate for the material and the project. Light, loose, and fluffy materials should be handled with a scoop-type shovel. A smaller shovel like a spade should be used for more dense material.
- **Use a long-handled shovel.** A long-handled shovel should be provided to avoid stooping during shoveling activities. Take the time to obtain the correct tool for the job.
- **Maintain load to 10 pounds per shovelful.** The general rule of thumb for the average work situation is 10 pounds per shovel load. Work performed is a function of repetition

and load. Increasing shovel loads will increase fatigue as repetitions increase and it will also increase the potential for injury.

Drum handling operations can be made safer by considering the following techniques:

- **Use a drum cart where feasible.** A four-wheel cart is preferred for drum handling because it is more stable, better latched, and has a better handle positioning. In addition, it is more easily tipped back and held in place when the drums are loaded.
- **Do not rotate from horizontal to vertical unless nearly empty.** Only empty or nearly empty drums should be rotated from horizontal to vertical. A tipster or forklift with a proper drum handling attachment is the preferred method.
- **Use handling equipment for moving drums from one level to another.** Whenever possible, pallets, scales, and conveyors should be recessed in the floor to avoid raising drums to another level. If not, drums should be handled on a low platform or an incline adapter should be provided.
- **Limit drum weight to 450 to 500 pounds.** Regardless of the material involved, drums should only be filled to a maximum weight of 700 pounds. Drums over 300 pounds shall not be handled by hand. Use of mechanical equipment is required. *(Example: water = 8.6 lb per gallon x 52 gallons = 447.2 lbs)*
- **Limit travel distance to 30 feet.** The other general guideline regarding drum handling involves keeping drum transport to a maximum of 30 feet.

9.1.13 Drowning Prevention

To assure personnel safety, the following guidelines will be employed when the threat of drowning exists at the site:

- Do not work alone.
- Wear a U.S. Coast Guard-approved personal flotation device (PFD-Type III).
- Check weather reports to confirm safe working conditions (avoid storms).
- Take care when exiting and entering the boat from land or barge.
- Make sure the barge or boat is securely anchored at the work location.
- If possible, use two individuals to lift heavy objects, such as sample coolers that are filled with samples.
- Stop work if water conditions become hazardous (e.g., high swells, storms, etc.)

9.2 Biological Hazards

Animal bites, especially in remote areas, always pose a risk. This can be minimized by being observant and not approaching animals exhibiting unusual behavior. Avoiding

contact with poison ivy, poison oak, or poison sumac, where present, will minimize the hazards from poisonous plants. Ways to reduce potential exposures to microbial hazards include using proper sanitation prior to eating or drinking liquids and limiting eating or drinking to areas outside the EZ. Treatment of stings can be handled by basic first-aid treatment. However, if personnel are allergic to bees or wasps, they should make this known to co-workers and have prescribed medication available while they are on site so that appropriate action can be taken. If a rodent nest or fecal pile is found, the area should be sprayed/soaked with bleach (again, a respirator and gloves should be worn). The materials used to perform the disinfecting of the area should also be disposed of in a dumpster. Personnel should be aware of their surroundings and wear the appropriate work clothing to minimize the amount of exposed skin.

10 PERSONAL PROTECTIVE AND SAFETY EQUIPMENT

The level of protection required to ensure the health and safety of field personnel will be determined by the SSO based on the specific site activities, available instrumentation readings, and professional experience and judgment. Based on the specific tasks associated with the work plan, field personnel shall wear Modified Level D PPE, depending on the task. Higher levels of PPE are not currently anticipated for this project. However, the Health and Safety Manager and SSO will adjust the level of PPE required for a specific work task, as necessary.

The Health and Safety Manager, in conjunction with the SSO, will establish action levels for minimum levels of protection for each area of the site where investigation activities will occur. The action levels will remain the same, but the level of protection may change due to changing site conditions.

10.1 Modified Level D Protection

Modified Level D PPE will be the initial requirement for all scoped tasks associated with the work plan. The Health and Safety Manager and SSO will upgrade and/or change the level of PPE as field conditions warrant. Modified Level D PPE includes the following:

- Coveralls or work clothes (dictated by weather).
- Tyvek coveralls (optional).
- Gloves (outer), chemical/liquid-resistant when there is a potential for wet work or contact with contaminated materials.
- Gloves (inner), chemical/liquid-resistant (surgical nitrile) when there is a potential to contact contaminated materials.

- Leather safety boots/shoes with chemical-resistant soles and steel-toed shanks when necessary.
- Safety glasses.
- Chemical-resistant boot covers when chemical hazards are present.
- Chemically protective safety boots as an alternative to leather boots with boot covers.
- Hardhat (with splash shield during high splash activities) and safety glasses.
- Hearing protection (where appropriate).

Use of Tyvek coveralls on site where work functions preclude splashes of chemicals or long-term contact with contaminated soil or water will be at the discretion of the SSO.

10.2 Unknown Environments

The requirement of field personnel entering unknown environments is not anticipated as part of the scope of work for this delivery order. If an unknown environment is encountered, personnel shall not enter the area until the chemical or physical hazards in the area can be identified and measures taken to reduce or eliminate those hazards.

10.3 Considerations for Selecting Levels of Protection

Factors to be considered in selecting the appropriate level of PPE include heat and cold stress; air-monitoring results; chemical, physical, and biological hazards associated with the task; routes of exposure; and weather conditions. The Health and Safety Manager will determine the level of PPE required for the specific work task following an evaluation of these factors. The SSO will be responsible for ensuring that all field personnel adhere to the PPE requirements. Based on existing information and data for the activities to be performed, modified Level D PPE will be the initial requirement for all scoped tasks. Exposure to elevated airborne concentrations of contaminants above the respective permissible exposure levels is considered to be low for the work plan; thus, the use of respiratory protection is anticipated only for collecting swipe samples inside on-site structures. However, if site conditions, field activities, or air-monitoring results indicate the need for respiratory protection during other field activities, the SSO and the Health and Safety Manager will evaluate the initial activities to be performed by site personnel, and if necessary, modifications to the PPE requirements will be implemented.

10.4 Personnel Protective Equipment (PPE) for Visiting Personnel

Site visitors will be required to have the appropriate PPE prior to site entry. No personnel will be allowed to enter the site if they do not have the appropriate PPE.

10.5 PPE Inspections

All PPE shall be inspected prior to, during, and after use. Inspectors will look for rips, tears, discolorations that may indicate bleed-through of chemicals, delamination, or any other signs of wear or degradation that would affect the effectiveness of protection. PPE will be stored in a manner that prevents degradation and is consistent with the manufacturer's instructions. Consideration should be given to ultra-violet damage, inability to dry/air-out, and unnecessary folds/creases. The SSO or the Health and Safety Manager will determine the need to repair or replace PPE.

10.6 Safety Equipment

Basic emergency and first aid equipment will be available in the support vehicle. All field personnel will be informed of the locations of the safety equipment and the proper use of the equipment. For the duration of the work plan, weekly inspections of the safety equipment will be performed by the SSO.

11 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURE

This section describes contingencies and emergency planning procedures to be implemented during the work plan. All incidents will be dealt with in a manner to minimize health risks to field personnel and the surrounding environment. In the event of an incident, the following procedures shall be completed at a minimum:

- First aid and other appropriate initial action will be administered by properly trained personnel closest to the incident. This assistance will be conducted in a manner to assure individuals rendering assistance are not placed in a situation of unacceptable risk.
- All incidents will be reported to and documented by the SSO, who is responsible for coordinating the emergency response in an efficient, rapid, and safe manner. The SSO will perform emergency equipment inspections to check that standard equipment is available on site to address likely emergencies.
- In the event of an accident or emergency, all workers on site are responsible to conduct themselves in a mature, calm manner to avoid spreading danger to themselves, the surrounding workers, or the community in general.

The initial response to any emergency will be to protect human health and safety. Secondary response to the emergency will be identification, containment, treatment, and disposal of contaminated materials. The local Fire Department will be called in all situations in which fires or explosions have occurred by dialing 911.

All field personnel will have access to the contact list provided in this HASP. If an emergency occurs that requires outside agency assistance or notification, site employees are instructed never to leave an emergency notification on an answering machine, but rather call the 24-hour emergency answering service number if no one answers the primary number.

Potential incidents fall under four general classifications: (a) worker injury or illness; (b) fire or explosion; (c) severe weather conditions such as tornado and lightning storms; and (d) chemical releases to the atmosphere, soil, or surface water.

11.1 Worker Injury or illness

If a non-life-threatening/serious injury occurs, the local hospital will be contacted for assistance prior to transporting the victim(s). The local hospital is Harborview Medical Center. Address and contact information are located prior to Section 1.0. A copy of a map showing the directions from the site to the Hospital is provided as Attachment D.

In the event of a medical emergency, personnel will take direction from the SSO (or alternate team leader if the SSO is injured), notify the appropriate emergency organization, and implement the following procedures:

- Call 911.
- Identify location, request medical assistance, and provide name and telephone number.
- Notify Shannon & Wilson's Health and Safety Manager and file an accident report.

11.2 Fire or Explosion

In the event of an emergency that necessitates the evacuation of the site, such as a fire or severe weather, field personnel will implement the following procedures:

- Field personnel will be alerted by sounding a portable horn, radio contact, or direct verbal means. (When air horns are used, two sustained blasts followed by one or two blasts will notify all personnel to exit.)
- Personnel in the work zone may or may not perform field decontamination prior to leaving the work zone, depending on the nature of the incident requiring the evacuation.
- Concurrent with the evacuation of field personnel, notification will be immediately made by dialing 911, indicating location of the incident, and providing information to local responders.

Immediately following an evacuation, a head count will be taken. Upon his/her arrival, the SSO, or his designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on site.

11.3 Severe Weather

When a severe storm warning has been issued or when a lightning storm occurs, the information will be immediately relayed to all field personnel who shall be notified to stand by for emergency procedures. After the storm warning is cancelled and the storm passes, the SSO will inspect all on-site equipment to ensure its readiness for operation. If any equipment has been damaged, the work will not be restarted until the equipment has been repaired or replaced.

If the SSO's inspection indicates that a fire, explosion, or release has occurred as the result of a severe weather condition, he/she will follow the appropriate procedures outlined in this section.

In regard to lightning, personnel will follow the "30/30 rule," which states that personnel will seek appropriate shelter when working outdoors if thunder is heard less than 30 seconds after the strike is seen. Personnel who have sheltered may resume working 30 minutes after the last thunder is heard.

11.4 Chemical Release/Spill Containment Program

The objective of this part of the HASP is to meet the requirements of 29 CFR 1910.120(b)(4)(ii)(j).

11.4.1 Spill Prevention

All hazardous substances will be stored in secure locations in containers of suitable type, properly labeled, with tight-fitting lids. Any investigation-derived wastewater or free product will be stored in 55- or 16-gallon drums until properly disposed of. Spill containment drip pans and duck ponds will be utilized, when applicable, to contain small leaks during sampling activities and transfer.

11.4.2 Large Spill Response

The primary spill response kit is located in the support vehicle. The kit contains absorbent pads, shovels, and personal safety equipment. In the event of a spill of a hazardous substance, immediate action will be taken by all personnel present. The following actions will be taken in the event of a spill, when applicable:

- Attend to significantly injured personnel.

- Stop the source (e.g., shut off a pump, stand up fallen container).
- Control the spill by berming, ditching, or immediately absorbing the substance.
- Report spill to the SSO, PM, the Health and Safety Manager, and applicable regulating agencies.

If the PM determines that clean up can be performed safely with project personnel, the SSO may act as the spill team leader and designate required procedures. Before work begins, the SSO must conduct a hazard identification and assessment with response personnel. The following must be discussed and established:

- Levels of PPE and safety procedures.
- Safety and work zones.
- All steps of the response activities.
- Most effective procedures for cleanup.
- Means of containment.
- Decontamination procedures.
- Emergency decontamination.

11.5 Post-Incident Follow-Up

The PM or SSO must implement the necessary steps to ensure that the incident is properly documented and that the emergency response equipment is replenished. The PM must direct the necessary corrective actions to present recurrence and evaluate the response.

11.6 Security

During activation of the emergency procedures, the SSO or designated representative will control access to the site and maintain a security incident log that will include at a minimum:

- Time of entry
- Expected exit time
- Task being performed
- Location of task
- Rescue and response equipment used
- Protective equipment used

12 REMEDIAL HOTSPOT EXCAVATION WORK AREAS

The work plan includes collection of soil samples within hotspot excavations where soil exceeds the project RL and is being removed. Activities completed within these areas require the use of additional measures to ensure that worker safety is protected, and that the field activities do not result in the contamination of previously uncontaminated areas. The following sections summarize additional site control, site preparation, communication, PPE, and decontamination and disposal procedures for investigation activities to be completed within the hotspot excavation areas.

All field staff should be sufficiently trained in the standard guidelines for the field activities they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work.

12.1 Site Control

Access to the work site will be restricted to designated personnel. To reduce the accidental spread of hazardous substances by workers or equipment from the contaminated area to the clean area, zones should be delineated on the site where different types of operations will occur, and the flow of personnel among the zones should be controlled. The establishment of work zones will help ensure that: personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

The area hotspot excavation areas will be separated as needed to meet operational and safety objectives. It is intended that the area be separated by the use of cones and tape into zones as follows:

- EZ, the contaminated area.
- Contamination Reduction Zone (CRZ), the area where decontamination takes place.
- Support Zone (SZ), the uncontaminated area where workers should not be exposed to hazardous conditions.

Movement of personnel and equipment among these zones should be minimized and restricted to specific Access Control Points to prevent cross-contamination from contaminated areas to clean areas.

An EZ/CRZ, and SZ will be set up for work being conducted within the limits of the work area. The full area designated for where hotspot excavation work will be undertaken is the

EZ. Only authorized personnel shall be permitted access to the EZ/CRZ. Staff will decontaminate all equipment and gear as necessary prior to exiting the CRZ. Staff will take care to prevent the transport of contaminated soils during decontamination.

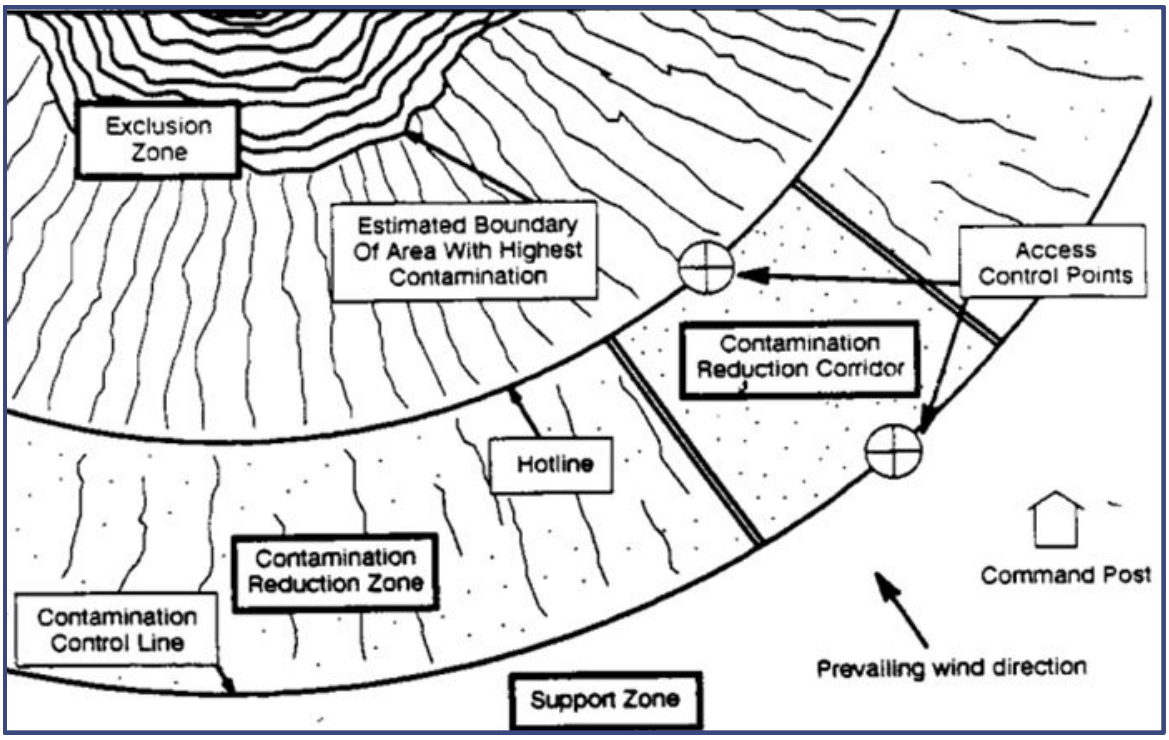

Exhibit 12-1: Illustration of Typical Work Zones

Provided by OSHA.gov

12.1.1 Exclusion Zone (EZ)

The EZ is the area where the hotspot excavations are occurring. The primary activities performed in the EZ are:

- Excavation work.

The personnel working in the EZ may include the field team members, the SSO, the PM, and specialized personnel such as heavy equipment operators. All personnel within the EZ should wear appropriate PPE (Section 12.4).

12.1.2 Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the contaminated area and the clean area. This zone is designed to reduce the probability that the clean SZ will become contaminated or affected by other site hazards. The distance between the EZ and SZ provided by the CRZ, together with decontamination of workers and equipment, limits the physical transfer of hazardous

substances into clean areas. The boundary between the CRZ and the EZ is called the Hotline. The degree of contamination in the CRZ decreases as one moves from the Hotline to the SZ, due both to the distance and the decontamination procedures. At many of the excavations the two zones will be merged due to site constraints, except in entrance area where sufficient space will be maintained to allow for decontamination.

Decontamination procedures take place in a designated area within the CRZ. Two lines of decontamination stations should be set up within the Contamination Reduction Corridor: one for personnel and one for heavy equipment. Access into and out of the CRZ from the EZ is through the Access Control Point. The equipment will only enter and exit once at the beginning and end of the excavation work.

Personnel entering the CRZ shall be required to wear the personal protective clothing and equipment prescribed for working in the CRZ. To reenter the SZ, workers should remove any protective clothing and equipment worn in the CRZ and leave through the personnel exit Access Control Point.

The CRZ must be well designed to facilitate:

- Decontamination of equipment, Personnel Decontamination Station operators, and personnel.
- Emergency response: first-aid equipment (such as bandages, blankets, eye wash, splints, and water); and containment equipment (absorbent and fire extinguisher).
- Equipment resupply: personal protective clothing and equipment (such as booties and gloves), sampling equipment (such as bottles and jars), and tools.
- Sample packaging and preparation for onsite or offsite laboratories.
- Worker temporary rest area: Water and other potable liquids should be clearly marked and stored properly to ensure that all glasses and cups are clean. Wash facilities should be located near drinking facilities to allow employees to wash before drinking. Drinking, and washing, should be located in a safe area where protective clothing can be removed.
- Drainage of water and other liquids that are used during decontamination.

Personnel within the CRZ should be required to maintain internal communications; line-of-sight contact with work parties; work party monitoring (e.g., fatigue, heat stress, and hypothermia); and site security.

12.1.3 Support Zone (SZ)

The SZ is the location of the administrative and other support functions needed to keep the operations in the EZ and CRZ running smoothly. Any function that need not or cannot be

performed in a hazardous or potentially hazardous area is performed here. The Command Post Supervisor should be present in the SZ. Other personnel present will depend on the functions being performed, and may include the field team members who are preparing to enter or who have returned from the EZ.

Personnel may wear standard PPE (10.1) within this zone. Any potentially contaminated clothing, equipment, and samples must remain in the CRZ until decontaminated.

SZ personnel are responsible for alerting the proper agency in the event of an emergency. All emergency telephone numbers, evacuation route maps, and vehicle keys should be kept in the SZ.

When setting up support facilities, consider factors such as:

- Accessibility. Topography, open space available, locations of highways and railroad tracks, and ease of access for emergency vehicles.
- Resources. Adequate roads, power lines, telephones, shelter, and water.
- Visibility. Line-of-sight to all activities in the EZ.
- Wind direction. Upwind of the EZ, if possible. If upwind locations are not feasible due to fencing or structures, the best cross-wind location should be selected.
- Distance. As far from the EZ as practicable.

12.2 Site Preparation

Time and effort must be spent in preparing a site to ensure that worker safety is protection, field activities go smoothly, that the field activities do not result in the contamination of previously uncontaminated areas, and that contamination is not transported outside of the EZ. Safety measures should be afforded the same level of care at this stage as during other field activities. Proper site preparation includes:

- Arrange traffic control signage to ensure safe and efficient operations.
- Eliminate physical hazards from the work area as much as possible, including:
  - Ignition sources in flammable hazard areas.
  - Exposed or ungrounded electrical wiring, and low overhead wiring that may entangle equipment.
  - Sharp or protruding edges, such as glass, nails, and torn metal, which can puncture protective clothing and equipment and inflict puncture wounds.
  - Debris, holes, loose steps or flooring, protruding objects, slippery surfaces, or unsecured railings, which can cause falls, slips, and trips.

  - Unsecured objects, such as bricks and gas cylinders, near the edges of elevated surfaces, such as catwalks, roof tops, and scaffolding, which may dislodge and fall on workers.
  - Debris and weeds that obstruct visibility.
- Provide adequate illumination for work activities. Equip any temporary lights with guards to prevent accidental contact.

The hotline should be clearly marked by lines, placards, hazard tape and/or signs; or enclosed by physical barriers, such as chains, fences, or ropes. Access Control Points should be established at the periphery of the EZ to regulate the flow of personnel and equipment into and out of the zone and to help verify that proper procedures for entering and exiting are followed. If feasible, separate entrances and exits should be established to separate personnel and equipment movement into and out of the EZ. The following steps describe how to establish the hotline:

- Visually survey the immediate site vicinity.
- Evaluate the results of previous soil and water sampling.
- Consider the physical area necessary for site operations.
- Consider meteorological conditions and the potential for contaminants to be blown from the area.
- Secure or mark the hotline.
- Modify its location, if necessary, as more information becomes available.

12.3 Communication

All site work will occur in teams and the primary means of communication on-site and with off-site contacts will be via cell phones. An agreed-upon system of alerting via air horns and/or vehicle horns may be used around heavy equipment to signal an emergency if shouting is ineffective. Any emergencies or significant incident situations will be immediately reported the PM.

12.4 Equipment Decontamination

Particulate matter and surface film will be removed using a brush. If necessary, the excavation equipment will use the truck wash to remove additional soil prior to transport off site.

ATTACHMENT A: SITE MAP

Attachment A

Site Map

BOEING THOMPSON PROPERTY

NORTH FIRE AISLE

NORTH OUTFALL (NO. 1)

SHEET PILE WALL

FORMER FIBERGLASS SHOP

OFF-HWY BUILDING DEMOLISHED

DEMOLISHED

FORMER BOILER HOUSE

WATER TOWER

WAREHOUSE

METAL RINSE DIP TANKS

CAB WASH

PAINT BOOTH

CAB PRIME

OVEN

NORTH PAINT BOOTH

SOUTH PAINT BOOTH

OVEN

CENTER CORE

MAIN LINE DYNAMOMETER

MEDICAL CENTER

FRAME TURN-OVER FIXTURE

CHASSIS PAINT BOOTH

OVEN

PIT

PAINT MIX AREA

WALL

EAST MARGINAL WAY

FORMER ADMINISTRATION BUILDING

SOUTH FIRE AISLE

FORMER STORM - MIDDLE OUTFALL (CLOSED 2004)

AS/SVE System

DUWAMISH WATERWAY

Wall Extends Back Onto Property

SEEP 4

SEEP 3

SEEP 2

SEEP 1

SEEP 6

CENTRAL OUTFALL (NO.2) (FORMER 8801 SOUTH OUTFALL)

RIP RAP

SEEP 5

FORMER SOUTHWEST STORAGE AREA

FORMER MONSANTO PARCEL

KING COUNTY STORM DRAIN LINE

ESTIMATED LOCATION OF FORMER DUWAMISH RIVER SHORELINE

CONTAINER PROPERTIES LLC

(INSURANCE AUTO AUCTIONS INCORPORATED VEHICLE STORAGE ON BOTH 8801 AND CONTAINER PROPERTIES PARCELS)

MUSEUM OF FLIGHT

N

NOTE

Figure adapted from AMEC *14995-L-32.dwg* dated 05/2013, and *14995-L-16.dwg* dated November 2010.

LEGEND

Existing Buildings

Former Buildings

AS/SVE Air Sparge/Soil Vapor Extraction

0 120 240

Scale in Feet

8801 East Marginal Way South
Tukwila, Washington

KEY PROPERTY FEATURES

May 2019 21-1-12567-014

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2

Filename: J:\21\1\12567\014\21-1-12567-014 Key Site Features.dwg Layout: Figure 2 Date: 05-01-2019 Login: jrs

ATTACHMENT B: DAILY SAFETY MEETING LOG

Attachment B

Daily Safety Meeting Log

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

DAILY SAFETY MEETING LOG

JOB NAME: _____ JOB NO: _____ BORING NO: _____

LOCATION: _____ DATE: / / TIME: :

SUBCONTRACTOR: _____ S&W REP: _____ S&W PM: _____

WORK DESCRIPTION: _____

CHECK APPLICABLE HAZARDS: Heavy Equipment ☐, Vehicles ☐, Overhead ☐, Tools ☐, Temperature ☐, Lifting ☐ (Use Mechanical Means Instead), Site Housekeeping ☐ (Clear Walkways to Prevent Slips, Trips, Falls), Awkward Work Area ☐, Public ☐, Security ☐, Plants ☐, Animals ☐, Noise ☐, Vibration ☐, Dust ☐, Radiation ☐, UV exposure ☐, Repetitive Motion ☐, Suspected Contamination ☐, Chemical Exposure ☐, Flammable/Explosive ☐

OTHER HAZARDS: _____

EQUIPMENT ON SITE: _____

DOCUMENTATION:	Present	PPE:	Present
SSHSP On Site?	☐	Boots - Safety Toe / Other	☐
Hospital Map On Site?	☐	Safety Glasses	☐
Fall Protection Plan On Site?	☐	Vest - Class II / Class III	☐
Respiratory Protection Plan On Site?	☐	Hard Hat	☐
Confined Space Entry Plan On Site?	☐	Ear - Plugs / Muffs / Both	☐
Traffic Control Plan?	☐	Gloves - Type: _____	☐
Other Plan? _____	☐	Face Shield	☐
Current Fit Test?	☐	Respirator	☐

Cards/Certs Required? *List Below*

_____

_____

Other PPE? *List Below*

_____

_____

Hazards & Controls Discussed? ☐

Need to Update SSHSP? ☐

My signature below confirms that the above hazards, controls and plans have been discussed and that I understand them.

PRINT NAME	SIGNATURE	COMPANY	HAS ALL CARDS	PPE On?
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

ATTACHMENT C: SAFETY DATA SHEETS

Attachment C

Safety Data Sheets

Right to Know Hazardous Substance Fact Sheet

Common Name: **ARSENIC**

Synonyms: Gray Arsenic; Arsen

Chemical Name: Arsenic

Date: June 1998 Revision: April 2008

CAS Number: 7440-38-2

RTK Substance Number: 0152

DOT Number: UN 1558

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Arsenic is a silver-gray or white metallic, odorless, brittle solid. It is used as an alloying agent for heavy metals, and in solders, medicines and herbicides.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	4	-
FLAMMABILITY	0	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Arsenic** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Arsenic** can affect you when inhaled and may be absorbed through the skin.
- **Arsenic** is a CARCINOGEN and may cause reproductive damage. HANDLE WITH EXTREME CAUTION.
- Skin contact can cause irritation, burns, rash and loss of pigment
- Eye contact can cause irritation and burns.
- Inhaling **Arsenic** can irritate the nose and throat and can cause an ulcer or hole in the "bone" (septum) dividing the inner nose.
- Exposure to **Arsenic** can cause weakness, poor appetite, nausea, vomiting, headache, and even death.
- **Arsenic** may damage the nervous system and the liver.
- **Arsenic** is a noncombustible solid, but when in *dust* or *fine powder* form it can EXPLODE when exposed to heat, flame or hot surfaces.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.01 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.002 mg/m^3**, which should not be exceeded at any time.

ACGIH: The threshold limit value (TLV) is **0.01 mg/m^3** averaged over an 8-hour workshift.

- **Arsenic** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Arsenic**:

- Skin contact can cause irritation, burns, rash and loss of pigment.
- Eye contact can cause irritation, burns and red, watery eyes.
- Inhaling **Arsenic** can irritate the nose and throat causing coughing and wheezing.
- Exposure to **Arsenic** can cause weakness, poor appetite, nausea, vomiting, headache, muscle cramps and even death.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Arsenic** and can last for months or years:

Cancer Hazard
- **Arsenic** is a CARCINOGEN in humans. It has been shown to cause skin and lung cancer.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- Chronic **Arsenic** exposure has been associated with spontaneous abortions and still births.
- There is limited evidence that **Arsenic** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Effects
- Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons may develop white lines on the nails.
- Long-term exposure can cause an ulcer or hole in the "bone" (septum) dividing the inner nose, hoarseness and sore eyes.
- **Arsenic** may damage the nervous system causing numbness, "pins and needles," and/or weakness in the hands and feet.
- **Arsenic** may damage the liver.

Medical

Medical Testing
Before first exposure and every 12 months thereafter, OSHA requires your employer to provide (for persons exposed to greater than **0.005 mg/m^3** of *Arsenic*) a work and medical history and exam which shall include:

- Chest x-ray
- Exam of the nose, skin and nails
- Test for urine **Arsenic**. This is most accurate at the end of the workday. Eating shellfish or fish may elevate **Arsenic** levels for up to two days. At NIOSH recommended exposure levels, urine **Arsenic** should not be greater than **100 micrograms per liter** of urine.

After suspected overexposure, repeat these tests and consider exam of the nervous system and liver function tests. Also examine your skin periodically for abnormal growth. Skin cancer from **Arsenic** can be easily cured when detected early.

OSHA requires your employer to provide you and your doctor with a copy of the OSHA *Inorganic Arsenic* Standard (29 CFR 1910.1018).

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Arsenic**.

Conditions Made Worse By Exposure
- May scientists believe that skin changes such as thickening and pigment changes make those skin areas more likely to develop skin cancer.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA *Inorganic Arsenic* Standard (29 CFR 1910.1018).
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Arsenic**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend *Nitrile*, *Natural Rubber* or *Silver Shield®* for gloves and DuPont *Tyvek®*, or the equivalent, as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear impact resistant eye protection with side shields.
- Wear a face shield with goggles when working with corrosive, high irritating or toxic substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure not higher than **0.1 mg/m^3**, use a half-mask air purifying respirator equipped with high efficiency filters.
- Where the potential exists for exposure not higher than **0.5 mg/m^3**, use a full facepiece, air purifying respirator with high efficiency filters.
- Where the potential exists for exposure not higher than **5 mg/m^3**, use any powered-air purifying respirator with high efficiency filters or a half-mask supplied-air respirator operated in a positive pressure mode.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Arsenic**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Exposure to **5 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **5 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Arsenic** is noncombustible, however, **Arsenic** *dust* or *fine powder* can explode when exposed to heat, flame or hot surfaces.
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Arsenic Oxides.*
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Arsenic** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.
- Ventilate area of spill after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Arsenic** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Arsenic** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Arsenic** is handled, used or stored as required by the OSHA *Inorganic Arsenic* Standard (29 CFR 1910.1018).
- **Arsenic** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.
- **Arsenic** reacts with ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and HYDROGEN GAS to produce toxic *Arsine gas*.
- **Arsenic** is not compatible with *powdered* METALS (such as ZINC, LITHIUM, RUBIDIUM and PLATINUM); BROMINE AZIDE; LEAD MONOXIDE; and MERCURY OXIDE.
- Store in tightly closed containers in a cool, well-ventilated area away from COMBUSTIBLES and HEAT.
- DO NOT store in metal tanks.

Occupational Health Information Resources

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For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

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OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **ARSENIC**

Synonyms: Gray Arsenic; Arsen
CAS No: 7440-38-2
Molecular Formula: As
RTK Substance No: 0152
Description: Silver-gray or white metallic, odorless, brittle solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
4 - Health **0 - Fire** **0 - Reactivity** **DOT#:** UN 1558 **ERG Guide #:** 152 **Hazard Class:** 6.1 (Poison)	**Arsenic** is noncombustible, however, *Arsenic dust* or *fine powder* can explode when exposed to heat, flame or hot surfaces. Use dry chemical, CO_2, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including *Arsenic Oxides*. Use water spray to keep fire-exposed containers cool.	**Arsenic** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions. **Arsenic** reacts with ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and HYDROGEN GAS to produce toxic *Arsine gas*. **Arsenic** is not compatible with *powdered* METALS (such as ZINC, LITHIUM, RUBIDIUM and PLATINUM); BROMINE AZIDE; LEAD MONOXIDE; and MERCURY OXIDE.

SPILL/LEAKS

Isolation Distance:

Spills: 25 to 50 meters (75 to 150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

DO NOT wash into sewer.

Toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Noncombustible solid
Vapor Pressure:	1 mm Hg at 701°F (372°C)
Specific Gravity:	5.7 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	1,350°F (613°C)
Ionization Potential:	9.87 eV
Molecular Weight:	74.9

EXPOSURE LIMITS

OSHA:	0.01 mg/m^3, 8-hr TWA
NIOSH:	0.002 mg/m^3, 15-min Ceiling
ACGIH:	0.01 mg/m^3, 8-hr TWA
IDLH:	5 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Natural Rubber, Nitrile or Silver Shield®
Coveralls:	DuPont Tyvek®
Respirator:	<0.1 mg/m^3 - Full facepiece APR with High efficiency filter <0.5 mg/m^3 -Supplied air

HEALTH EFFECTS

Eyes:	Irritation, burns, red and watery eyes
Skin:	Irritation, burns, itching, rash and loss of pigment
Inhalation:	Nose and throat irritation with coughing, wheezing and hoarseness
Chronic:	Weakness, headache, nausea, vomiting, and muscle cramps Cancer (skin and lung) in humans

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer to a medical facility.

Right to Know Hazardous Substance Fact Sheet

Common Name: **BENZENE**

Synonyms: Benzin; Benzol; Phenyl Hydride

Chemical Name: Benzene

Date: January 2001 Revision: October 2008

CAS Number: 71-43-2

RTK Substance Number: 0197

DOT Number: UN 1114

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Benzene is a clear, colorless liquid with a sweet *Petroleum*-like odor. It is used as a solvent and in making plastics, resins dyes and pesticides. It is also found in *Gasoline*.

- **ODOR THRESHOLD= 12 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	4	2
FLAMMABILITY	-	3
REACTIVITY	-	0

CARCINOGEN
FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Benzene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Benzene** can affect you when inhaled and by passing through the skin.
- **Benzene** is a CARCINOGEN and MUTAGEN. HANDLE WITH EXTREME CAUTION.
- **Benzene** can irritate the skin and eyes with drying and scaling of the skin.
- Inhaling **Benzene** can irritate the nose and throat.
- **Benzene** can cause headache, dizziness, nausea and vomiting. Convulsions and coma, or sudden death from irregular heartbeat, may follow high exposure.
- Repeated exposure can cause damage to the blood cells (aplastic anemia).
- **Benzene** is a FLAMMABLE LIQUID and a DANGEROUS FIRE HAZARD.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15-minute work period.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 ppm** averaged over a 10-hour workshift and **1 ppm**, not to be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **0.5 ppm** averaged over an 8-hour workshift and **2.5 ppm** as a STEL (short-term exposure limit).

- **Benzene** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzene**:

- Contact can irritate the skin and eyes.
- Inhaling **Benzene** can irritate the nose and throat causing coughing and wheezing.
- **Benzene** can cause headache, dizziness, lightheadedness, nausea and vomiting. Convulsions and coma, or sudden death from irregular heartbeat, may follow high exposure.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Benzene** and can last for months or years:

Cancer Hazard
- **Benzene** is a CARCINOGEN in humans. It has been shown to cause leukemia.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- There is limited evidence that **Benzene** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Effects
- **Benzene** can cause drying and scaling of the skin.
- Repeated exposure can cause damage to the blood cells (aplastic anemia).

Medical

Medical Testing
Before first exposure and every 12 months thereafter, OSHA requires your employer to provide (for persons exposed to greater than **0.5 ppm** of *Benzene*) a work and medical history and exam, which shall include:

- Thorough physical examination
- Complete blood count (CBC)
- Any other tests determined necessary by the examining physician

OSHA requires your employer to provide you and your doctor with a copy of the OSHA *Benzene* Standard (29 CFR 1910.1028).

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA *Benzene* Standard (29 CFR 1910.1028).
- Before entering a confined space where **Benzene** may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Benzene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Fluoroelastomer for gloves and Tychem® CPF 3, F, BR, LV, Responder®, and TK; Zytron® 300; and ONESuit® TEC, or the equivalent, as protective materials for *Hydrocarbons, Aromatic*.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
- Do not wear contact lenses when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.5 ppm**, use a NIOSH approved full facepiece respirator with an organic vapor cartridge. Increased protection is obtained from full facepiece powered-air purifying respirators.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Benzene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **5 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **500 ppm** is immediately dangerous to life and health. If the possibility of exposure above **500 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Benzene** is a FLAMMABLE LIQUID.
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- Use water as fog, as spray may be ineffective and may scatter and spread fire.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to reduce vapors and keep containers cool.
- Vapors may travel to a source of ignition and flash back.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benzene** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- Ventilate area of spill or leak.
- Keep **Benzene** out of confined spaces, such as sewers, because of the possibility of an explosion.
- Use water spray to reduce vapors and keep containers cool.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Benzene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benzene** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Benzene** is handled, used or stored as required by the OSHA *Benzene* Standard (29 CFR 1910.1028).
- **Benzene** reacts violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).
- **Benzene** ignites on contact with CHROMIC ANHYDRIDE.
- **Benzene** is not compatible with LIQUID OXYGEN, HYDROGEN, and RANEY NICKEL.
- Store in tightly closed containers in a cool, well-ventilated area away from AIR and HEAT.
- **Benzene** attacks some RUBBER, COATINGS and PLASTICS.
- Sources of ignition, such as smoking and open flames, are prohibited where **Benzene** is used, handled, or stored.
- Metal containers involving the transfer of **Benzene** should be grounded and bonded.
- Use explosion-proof electrical equipment and fittings wherever **Benzene** is used, handled, manufactured, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Benzene**.

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New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

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A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **BENZENE**

Synonyms: Benzin; Benzol; Phenyl Hydride
CAS No: 71-43-2
Molecular Formula: C_6H_6
RTK Substance No: 0197
Description: Clear, colorless liquid with a sweet *Petroleum*-like odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
4 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 1114 **ERG Guide #:** 130 **Hazard Class:** 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO_2, water spray or foam as extinguishing agents. Use water as fog, as spray may be ineffective and may scatter and spread fire. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to reduce vapors and keep containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	**Benzene** reacts violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). **Benzene** ignites on contact with CHROMIC ANHYDRIDE. **Benzene** is not compatible with LIQUID OXYGEN, HYDROGEN, and RANEY NICKEL.

SPILL/LEAKS

Isolation Distance:

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **Benzene** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Benzene is very toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	12 ppm
Flash Point:	12°F (-11°C)
LEL:	1%
UEL:	8%
Auto Ignition Temp:	928° to 1,076°F (498° to 580°C)
Vapor Density:	2.7 (air = 1)
Vapor Pressure:	75 mm Hg at 68°F (20°C)
Specific Gravity:	0.88 (water = 1)
Water Solubility:	Slightly soluble
Boiling Point:	176°F (80°C)
Freezing Point:	42°F (6°C)
Ionization Potential:	9.24 eV
Molecular Weight:	78.1

EXPOSURE LIMITS

OSHA:	1 ppm, 8-hr TWA; 5 ppm, 15-min STEL
NIOSH:	0.1 ppm, 10-hr TWA; 1 ppm, 15-min STEL
ACGIH:	0.5 ppm, 8-hr TWA; 2.5 ppm, 15-min STEL
IDLH:	500 ppm ERPG-1: 50 ppm; ERPG-2: 150 ppm EPRG-3: 1,000 ppm

PROTECTIVE EQUIPMENT

Gloves:	Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Fluoroelastomer (>8-hr breakthrough)
Coveralls:	Tychem® CPF 3, F, BR, LV, Responder®, and TK; Zytron® 300; and ONESuit® TEC (>8-hr breakthrough for *Hydrocarbons, Aromatic*)
Respirator:	>0.5 ppm - Supplied air or SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Inhalation:	Nose and throat irritation with coughing and wheezing Headache, dizziness, convulsions and coma
Chronic:	Cancer (leukemia) in humans

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

October 2008

Right to Know Hazardous Substance Fact Sheet

Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P

Chemical Name: Benzo[a]pyrene

Date: July 1998 Revision: October 2007

CAS Number: 50-32-8

RTK Substance Number: 0207

DOT Number: UN 3077

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Benzo(a)pyrene is a pale yellow, crystalline solid or powder with a faint aromatic odor. In its pure form it is used as a laboratory reagent. It also forms as a gaseous by-product when certain carbon substances burn, such as coal tar chemicals, and is found in cigarette smoke.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Benzo(a)pyrene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Benzo(a)pyrene** can affect you when inhaled and by passing through the skin.
- **Benzo(a)pyrene** is a CARCINOGEN. HANDLE WITH EXTREME CAUTION.
- **Benzo(a)pyrene** may damage the developing fetus.
- Contact can irritate and burn the eyes.
- **Benzo(a)pyrene** can irritate the skin causing a rash or burning feeling on contact.
- Repeated exposure can cause thickening and darkening of the skin.
- Except in laboratories, **Benzo(a)pyrene** is usually found mixed with other "coal tar pitch" chemicals.
- *For more information, consult the Right to Know Hazardous Substance Fact Sheets on COAL TAR PITCH, CREOSOTE, CHRYSENE, and ANTHRACENE.*

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Remove contaminated clothing. Wash contaminated skin with soap and water.

Inhalation

- Remove the person from exposure.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m^3** (as *Coal Tar Pitch Volatiles*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m^3** (as the *Cyclohexane-extractable fraction*) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(a)pyrene**:

- Contact can irritate and burn the eyes.
- **Benzo(a)pyrene** can irritate the skin causing a rash or burning feeling on contact. Exposure to a combination of sunlight and this chemical can increase these effects.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(a)pyrene** and can last for months or years:

Cancer Hazard
- **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There is some evidence that is causes stomach, skin, lung, blood, spleen, pancreas, and mammary cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **Benzo(a)pyrene** may damage the developing fetus.
- There is limited evidence that **Benzo(a)pyrene** may damage the male and female reproductive systems.

Other Effects
- Repeated exposure can cause thickening and darkening of the skin and warts.

Medical

Medical Testing
There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Sunlight may cause a rash to develop in people exposed to **Benzo(a)pyrene** and increases the risk of skin cancer.
- Tobacco smoke also contains **Benzo(a)pyrene**. Smoking may increase the risk of lung cancer with exposure to **Benzo(a)pyrene.**

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.

NJ Health
New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **GASOLINE**

Synonyms: Benzin; Motor Fuel; Petrol
CAS No: 8006-61-9
Molecular Formula: C_5H_{12} to C_9H_{20} (Mixture of hydrocarbons which vary by grade)
RTK Substance No: 0957
Description: Clear, colorless to amber-colored liquid with a petroleum odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 1203 **ERG Guide #:** 128 **Hazard Class:** 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO_2, alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic charges.	**Gasoline** may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.

SPILL/LEAKS

Isolation Distance:
Spill: 50 meters (150 feet)
Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Gasoline** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Gasoline**.

DO NOT wash into sewer.

Gasoline is harmful to aquatic organisms and is a marine pollutant.

PHYSICAL PROPERTIES

Odor Threshold:	0.25 ppm
Flash Point:	-36°F (-38°C)
LEL:	1.2%
UEL:	7.6%
Auto Ignition Temp:	536° to 853°F (280° to 456°C)
Vapor Density:	3 to 4 (air = 1)
Vapor Pressure:	38 to 300 mm Hg at 68°F (20°C)
Specific Gravity:	0.73 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	140° to 390°F (60° to 199°C)
Molecular Weight:	72 to 100

EXPOSURE LIMITS

ACGIH: 300 ppm, 8-hr TWA; 500 ppm, STEL

The Protective Action Criteria values are:
PAC-1 = 500 ppm,
PAC-2 = 500 ppm
PAC-3 = 1,500 ppm

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Viton (>8-hr breakthrough)
Coveralls:	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough)
Respirator:	>300 ppm - Supplied air or SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns
Inhalation:	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, nausea, weakness, dizziness, blurred vision, irregular heartbeat, and passing out
Chronic:	Cancer (liver) in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Gasoline** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.
- Keep **Gasoline** out of confined spaces, such as sewers, because of the possibility of an explosion.
- Use water spray to keep containers cool.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Gasoline** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Gasoline** you should be trained on its proper handling and storage.

- **Gasoline** may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Gasoline** is used, handled, or stored.
- Metal containers involving the transfer of **Gasoline** should be grounded and bonded.
- Use explosion-proof electrical equipment and fittings wherever **Gasoline** is used, handled, manufactured, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Gasoline**.
- Flow or agitation may generate electrostatic charges.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Gasoline** may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Gasoline**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Viton for gloves, and Tychem® BR, LV, Responder® and TK, or the equivalent, as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **300 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Gasoline** is a FLAMMABLE LIQUID.
- Use dry chemical, CO_2, alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Vapors may travel to a source of ignition and flash back.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Gasoline**:

- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Gasoline** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- High exposure can cause headache, nausea, weakness, dizziness, blurred vision, irregular heartbeat, poor coordination, lightheadedness, and passing out.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Gasoline** and can last for months or years:

Cancer Hazard
- **Gasoline** may be a CARCINOGEN in humans since it has been shown to cause liver cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- There is limited evidence that **Gasoline** may damage the developing fetus and may affect female fertility.

Other Effects
- Prolonged or repeated exposure can cause drying and cracking of the skin with redness.
- Repeated high exposure may affect the lungs and brain.
- **Gasoline** may damage the liver.

Medical

Medical Testing
If symptoms develop or overexposure is suspected, the following are recommended:

- Chest x-ray and lung function tests
- Liver function tests
- Exam of the nervous system
- EEG

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Gasoline**.

Right to Know
Hazardous Substance Fact Sheet

Common Name: **COPPER**

Synonyms: Bronze Powder; Gold Bronze

Chemical Name: Copper

Date: September 2008 Revision: September 2016

CAS Number: 7440-50-8

RTK Substance Number: 0528

DOT Number: UN 3077

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Copper is a reddish-brown, odorless metal. It is used in electrical wiring and plumbing, in alloys and protective coatings for other metals, and in insecticides, fungicides and herbicides.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	1	-
REACTIVITY	1	-
FINELY DIVIDED **COPPER** MAY BURN OR EXPLODE IN AIR POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Copper** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP and EPA.

- **Copper** can affect you when inhaled
- Contact can irritate and burn the skin and eyes.
- Inhaling **Copper** can irritate the nose and throat.
- Inhaling **Copper** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose.
- **Copper** can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- Exposure to **Copper** can cause a flu-like illness called *metal fume fever*.
- **Copper** may cause a skin allergy.
- **Copper** may affect the liver and kidneys.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m³** (as **Copper** *dusts* and *mists*) and **0.1 mg/m³** (as **Copper** *fume*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **1 mg/m³** (as **Copper** *dusts* and *mists*) and **0.1 mg/m³** (as **Copper** *fume*) averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **1 mg/m³** (as **Copper** *dusts* and *mists*) and **0.2 mg/m³** (as **Copper** *fume*) averaged over an 8-hour workshift.

High-temperature operations such as welding, brazing, soldering, plating, cutting, and metallizing often generate fumes that have different health effects and exposure standards than the metal, metal compound or metal alloy originally used.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (http://www.state.nj.us/health/workplacehealthandsafety/right-to-know/) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Copper**:

- Contact can irritate and burn the skin and eyes.
- Inhaling **Copper** can irritate the nose and throat, causing coughing and wheezing.
- **Copper** can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- Exposure to **Copper** can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Copper** and can last for months or years:

Cancer Hazard
- While **Copper** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- **Copper** may decrease fertility in males and females.

Other Effects
- Inhaling **Copper** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- Repeated exposure may cause a greenish discoloration of the skin, hair and teeth.
- **Copper** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- **Copper** may affect the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

- Serum and urine **Copper** levels

If symptoms develop or overexposure is suspected, the following are recommended:

- Evaluation by a qualified allergist can help diagnose skin allergy
- Liver and kidney function tests
- Examination of the skin and nose

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Copper**.

Conditions Made Worse By Exposure
- "Wilson's Disease" is a rare condition which interferes with the body's ability to get rid of **Copper**. If you have this illness, consult your doctor about **Copper** exposure.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where *finely divided* **Copper** *powder* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Copper**. Wear personal protective equipment made from material which cannot be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as a protective material for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.1 mg/m³** (as **Copper** *fume*) or over **1 mg/m³** (as **Copper** *dusts* and *mists*), use a NIOSH approved air-purifying, particulate filter respirator with an N95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Copper**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **1 mg/m³** (as **Copper** *fume*) or over **10 mg/m³** (as **Copper** *dusts* and *mists*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **100 mg/m³** (as **Copper** *dusts* and *mists*) is immediately dangerous to life and health. If the possibility of exposure above **100 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Copper** itself does not burn.
- *Finely divided* **Copper** *powder* may burn in air or become an explosion hazard.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Copper fumes* and *Copper Oxides*.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Copper** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Copper** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Copper** you should be trained on its proper handling and storage.

- *Finely divided* **Copper** *powder* reacts violently on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); AZIDES; ETHYLENE OXIDE; IODATES; HYDRAZINES; POTASSIUM COMPOUNDS; SODIUM COMPOUNDS; and ACETYLENES.
- **Copper** is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); 1-BROMO-2-PROPYNE; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and ANHYDROUS AMMONIA.
- Store in tightly closed containers in a cool, well-ventilated area away from MOISTURE.
- Sources of ignition, such as smoking and open flames, are prohibited where *finely divided* **Copper** *powder* is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.nj.gov
Web address:
http://www.state.nj.us/health/workplacehealthandsafety/right-to-know/

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

NJ Health New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **COPPER**

Synonyms: Bronze Powder; Gold Bronze
CAS No: 7440-50-8
Molecular Formula: Cu
RTK Substance No: 0528
Description: Reddish-brown, odorless metal

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **1 - Fire** **1 - Reactivity** **DOT#: UN 3077** **ERG Guide #: 171** **Hazard Class: 9** (Environmentally Hazardous Material)	Extinguish fire using an agent suitable for type of surrounding fire. **Copper** itself does not burn. *Finely divided* **Copper** *powder* may burn in air or become an explosion hazard. POISONOUS GASES ARE PRODUCED IN FIRE, including *Copper fumes* and *Copper Oxides*. Use water spray to keep fire-exposed containers cool.	*Finely divided* **Copper** *powder* reacts violently on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); AZIDES; ETHYLENE OXIDE; IODATES; HYDRAZINES; POTASSIUM COMPOUNDS; SODIUM COMPOUNDS; and ACETYLENES. **Copper** is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); 1-BROMO-2-PROPYNE; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and ANHYDROUS AMMONIA.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

Copper is a toxic water pollutant.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Noncombustible *solid* Combustible/Explosive *finely divided powder*
Vapor Pressure:	1 mm Hg at 2,962°F (1,628°C)
Specific Gravity:	8.9 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	4,653°F (2,567°C)
Melting Point:	1,981°F (1,083°C)
Molecular Weight:	63.6

EXPOSURE LIMITS

OSHA: 1 mg/m^3(Dust), 0.1 mg/m^3(Fume), 8-hr TWA
NIOSH: 1 mg/m^3(Dust), 0.1 mg/m^3(Fume), 10-hr TWA
ACGIH: 1 mg/m^3(Dust), 0.2 mg/m^3(Fume), 8-hr TWA
(All the above are for *Copper dust and fume*)
IDLH: 100 mg/m^3 (as *Copper*)
PAC: PAC-1 = 3 mg/m^3; PAC-2 = 33 mg/m^3
PAC-3 = 200 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Natural Rubber
Coveralls:	DuPont Tyvek®
Respirator:	>0.1 mg/m^3 - Full facepiece APR with High efficiency filter >1 mg/m^3 - Supplied air (Fume) >10 mg/m^3 - Supplied air (Dust/Mist)

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns
Inhalation:	Nose and throat irritation with coughing and wheezing Headache, nausea, vomiting and abdominal pain

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility

Right to Know
Hazardous Substance Fact Sheet

Common Name: **GASOLINE**

Synonyms: Benzin; Motor Fuel; Petrol

Chemical Name: Gasoline, Natural

Date: April 2003 Revision: December 2008

CAS Number: 8006-61-9

RTK Substance Number: 0957

DOT Number: UN 1203

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Gasoline is a clear, colorless to amber-colored liquid with a petroleum odor. It is a blend of hydrocarbons used as an automotive fuel and as a solvent.

- **ODOR THRESHOLD= 0.25 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- **Gasoline** is on the Right to Know Hazardous Substance List because it is cited by ACGIH, DOT, NIOSH, DEP, IARC and NFPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact
- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact
- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation
- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	2	1
FLAMMABILITY	-	3
REACTIVITY	-	0

CARCINOGEN
FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Gasoline** can affect you when inhaled and by passing through the skin.
- **Gasoline** should be handled as a CARCINOGEN–WITH EXTREME CAUTION.
- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Gasoline** can irritate the nose, throat and lungs.
- High exposure can cause headache, dizziness, lightheadedness, and passing out.
- Prolonged or repeated exposure can cause drying and cracking of the skin with redness.
- Repeated high exposure may affect the lungs and brain.
- **Gasoline** may damage the liver.
- **Gasoline** may contain *Lead* and *Benzene*. *For more information, consult the Right to Know Hazardous Substance Fact Sheets on BENZENE and TETRAETHYL LEAD.*
- **Gasoline** is a FLAMMABLE LIQUID and a DANGEROUS FIRE HAZARD.

Workplace Exposure Limits

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **300 ppm** averaged over an 8-hour workshift and **500 ppm** as a STEL (short-term exposure limit).

- **Gasoline** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium
CAS No: 7440-47-3
Molecular Formula: Cr
RTK Substance No: 0432
Description: Hard, gray, odorless solid with a metallic luster

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 3089 **ERG Guide #:** 170 **Hazard Class:** 4.1 (Flammable Solid)	Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn. **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air. Use dry sand or dry chemical extinguishing agents to fight **Chromium** *powder* fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. DO NOT get water inside container.	**Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE. **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Keep **Chromium** *powder* out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Noncombustible solid, Flammable *powder*
Vapor Pressure:	<0 mm Hg at 68°F (20°C) (approximate)
Specific Gravity:	7.2 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	4,788°F (2,642°C)
Melting Point:	3,452°F (1,900°C)
Molecular Weight:	52

EXPOSURE LIMITS

OSHA:	1 mg/m^3, 8-hr TWA
NIOSH:	0.5 mg/m^3, 8-hr TWA
ACGIH:	0.5 mg/m^3, 8-hr TWA
IDLH:	250 mg/m^3

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m^3 PAC-3 = 250 mg/m^3
PAC-2 = 2.5 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile or Natural Rubber
Coveralls:	Tyvek®
Respirator:	>0.5 mg/m^3 - full facepiece APR with High efficiency filters >1.5 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation, burns and possible eye damage
Skin:	Irritation, burns, itching, rash and skin ulcers
Inhalation:	Nose and throat irritation with coughing and wheezing Headache, fever and chills

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

GLOSSARY

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OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Chromium** *powder* is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Keep **Chromium** *powder* out of confined spaces, such as sewers, because of the possibility of an explosion.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Chromium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Chromium** you should be trained on its proper handling and storage.

- **Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE.
- **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Chromium** *powder* is used, handled, or stored.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Chromium** *powder* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Chromium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective material for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.5 mg/m^3**, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Chromium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **5 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **250 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **250 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn.
- **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.
- Use dry sand or dry chemical extinguishing agents to fight **Chromium** *powder* fires.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- DO NOT get water inside container.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chromium**:

- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Chromium** can irritate the nose and throat causing coughing and wheezing.
- Exposure to **Chromium** *fumes* can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Chromium** and can last for months or years:

Cancer Hazard
- While **Chromium** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- There is no evidence that **Chromium** affects reproduction. This is based on test results presently available to the NJDHSS from published studies.

Other Effects
- Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- **Chromium** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- **Chromium** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.
- Prolonged skin contact can cause burns, blisters and deep ulcers
- **Chromium** may affect the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Lung function tests. The results may be normal if the person is not having an attack at the time of the test.

If symptoms develop or overexposure is suspected, the following are recommended:

- Examine your skin periodically for little bumps or blisters, the first sign of "chrome ulcers." If not treated early, these can last for years after exposure.
- Evaluation by a qualified allergist can help diagnose skin allergy.
- Liver and kidney function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Chromium**.

Right to Know

Hazardous Substance Fact Sheet

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium

Chemical Name: Chromium

Date: January 2000 Revision: March 2009

CAS Number: 7440-47-3

RTK Substance Number: 0432

DOT Number: UN 3089

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Chromium is a hard, gray, odorless solid with a metallic luster. It is used in stainless and alloy steels, in making alloys, and as an isotope in medicine and research.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	2	-
FLAMMABILITY	3	-
REACTIVITY	0	-

FLAMMABLE POWDER
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Chromium** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Chromium** can affect you when inhaled.
- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Chromium** can irritate the nose and throat.
- Exposure to **Chromium** *fumes* can cause a flu-like illness called *metal fume fever.*
- **Chromium** may cause a skin allergy and an asthma-like allergy
- Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose.
- **Chromium** may affect the liver and kidneys.
- **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact
- Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact
- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation
- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.5 mg/m^3** averaged over a 8-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.5 mg/m^3** averaged over an 8-hour workshift.

NJ Health
New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P
CAS No: 50-32-8
Molecular Formula: $C_{20}H_{12}$
RTK Substance No: 0207
Description: Pale yellow, crystalline solid or powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 3077 **ERG Guide #:** 171 **Hazard Class:** 9 (Miscellaneous Hazardous Materials)	**Benzo(a)pyrene** may burn, but does not readily ignite. Use dry chemical, CO_2, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE.	**Benzo(a)pyrene** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.

SPILL/LEAKS

Isolation Distance: 50 meters (150 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	Faint aromatic odor
Flash Point:	No information
Specific Gravity:	1.35
Vapor Density:	8.7 (air = 1)
Vapor Pressure:	5.49×10^{9} mm Hg at 77°F (25°C)
Water Solubility:	Insoluble
Boiling Point:	590° - 594°F (310° - 312°C)
Melting Point:	347° - 354 F (175 ° - 179°C)

EXPOSURE LIMITS

OSHA:	0.2 mg/m^3, 8-hr TWA
NIOSH:	0.1 mg/m^3, 10-hr TWA
ACGIH:	lowest level possible
IDLH LEVEL:	80 mg/m^3 (as *Coal Tar Pitch Volatiles*)

PROTECTIVE EQUIPMENT

Gloves:	No information
Coveralls:	DuPont Tychem®, CPF-2, SL, CPF-4, Responder® (all >8-hr permeation time)
Boots:	No information
Respirator:	>0.1 mg/m^3 - Supplied air

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation, rash and burning feeling
Chronic:	Cancer (stomach, skin, lung, blood, spleen, pancreas, and mammary) in animals. May affect the developing fetus Thickening and darkening of the skin and warts

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Remove contaminated clothing and wash contaminated skin with soap and water.

Transfer to a medical facility.

BENZO(a)PYRENE

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Use a Class I, Type B, biological safety hood when working with **Benzo(a)pyrene** in a laboratory.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Benzo(a)pyrene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend DuPont *Tychem® CPF-2, SL, CPF-4* and *Responder®* as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Do not wear contact lenses when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.1 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Benzo(a)pyrene** may burn, but does not readily ignite.
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benzo(a)pyrene** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first to reduce dust or use a HEPA-filter vacuum for clean-up.
- Ventilate and wash area after clean-up is complete.
- It may be necessary to contain and dispose of **Benzo(a)pyrene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP), Nuclear Regulatory Commission (NRC) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benzo(a)pyrene** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Benzo(a)pyrene** is handled, used, or stored.
- **Benzo(a)pyrene** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Benzo(a)pyrene** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Right to Know Hazardous Substance Fact Sheet

Common Name: **MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS**

Synonyms: Colloidal Mercury; Quicksilver

Chemical Name: Mercury

Date: May 2009 Revision: November 2009

CAS Number: 7439-97-6

RTK Substance Number: 1183

DOT Number: UN 2809

Description and Use

Mercury is a heavy, silvery, liquid metal. It is used for gold recovery and in dental amalgams, thermometers, barometers and other gauges, and in dry cell batteries.

Reasons for Citation

- **Mercury** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	-
FLAMMABILITY	0	-
REACTIVITY	0	-

CORROSIVE
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Mercury** can affect you when inhaled and may be absorbed through the skin.
- Contact can irritate the skin and eyes.
- Inhaling **Mercury** can irritate the nose, throat and lungs.
- Exposure can cause metallic taste in the mouth, nausea and vomiting, and abdominal pain.
- **Mercury** may cause a skin allergy and make the skin turn gray.
- Repeated exposure can cause *Mercury poisoning* with tremors, personality changes, trouble remembering and concentrating, and gum problems.
- **Mercury** may damage the kidneys.
- **Mercury** is a DOT CORROSIVE material.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.1 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.05 mg/m^3** (as **Mercury** *vapor*) averaged over a 10-hour workshift and **0.1 mg/m^3** (as **Mercury**), not to be exceeded at any time.

ACGIH: The threshold limit value (TLV) is **0.025 mg/m^3** averaged over an 8-hour workshift.

- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Mercury**:

- Contact can irritate the skin and eyes.
- Inhaling **Mercury** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure can cause metallic taste in the mouth, nausea and vomiting, and abdominal pain.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Mercury** and can last for months or years:

Cancer Hazard
- While **Mercury** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- There is limited evidence that **Mercury** may cause an increase in spontaneous abortions and menstrual disorders in exposed women.
- There is limited evidence that **Mercury** may affect male fertility.
- **Mercury** may also damage the developing fetus in animals.

Other Effects
- **Mercury** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- **Mercury** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Long-term contact can cause the skin to turn gray, brown staining in the eyes, and may affect peripheral vision (ability to see to the sides).
- Repeated exposure or a very high single exposure can cause *Mercury poisoning*. Symptoms include tremors (shaking), trouble remembering and concentrating, gum problems, increased salivation, loss of appetite and weight, and changes in mood and personality. These can be severe and cause hallucinating and psychosis.
- **Mercury** may damage the kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Exam of the nervous system (including handwriting test to detect early hand tremor)
- Urine *Mercury* level (usually less than **0.02 mg/liter**)
- Kidney function tests

If symptoms develop or overexposure is suspected, the following is recommended:

- Lung function tests
- Exam of the eyes and vision
- Evaluation by a qualified allergist can help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- Creams to whiten or bleach skin may contain *Mercury*. If you use them, you may be at increased risk of *Mercury* poisoning. A high fish diet, especially of marine predatory fish (fish-eating fish), also may increase your blood *Mercury* levels.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- For clean-up, use a specialized charcoal-filtered vacuum or suction pump to avoid generating *Mercury vapor*. Do not disturb spilled material.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Mercury**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton for gloves, and Tychem® fabrics, or the equivalent, as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.05 mg/m^3** (as **Mercury** *vapor*), or over **0.1 mg/m^3** but less than **1 mg/m^3** (as **Mercury**), use a NIOSH approved half-mask respirator with cartridges specific for **Mercury** *vapor*. These cartridges have end of service life indicators (ESLI) which visually indicate when filters must be changed.
- If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Mercury**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **0.5 mg/m^3** (as **Mercury** *vapor*) or over **1 mg/m^3** (as **Mercury**), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **10 mg/m^3** (as **Mercury**) is immediately dangerous to life and health. If the possibility of exposure above **10 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Mercury** itself does not burn.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Mercury** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Cover with a *Sulfur compound* to keep from vaporizing and collect with a charcoal filter vacuum. Kits specific for the clean-up of *Mercury* spills are available. DO NOT USE a regular or shop vacuum.
- Use *Zinc* or *Copper flakes* and a flashlight to check for remaining **Mercury** after clean-up.
- Ventilate and wash area of spill or leak.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Mercury** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Mercury** you should be trained on its proper handling and storage.

- **Mercury** reacts with ACETYLENE to form explosive *Acetylide*.
- **Mercury** can form explosive compounds with AMMONIA and will explode when mixed with CHLORINE DIOXIDE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and METHYL AZIDE.
- **Mercury** is not compatible with COMBUSTIBLE MATERIALS; METALS (such as ALUMINUM and COPPER); CALCIUM; SODIUM CARBIDE; AMINES; LITHIUM; and RUBIDIUM.
- Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

NJ Health New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS**

Synonyms: Colloidal Mercury; Quicksilver
CAS No: 7439-97-6
Molecular Formula: Hg
RTK Substance No: 1183
Description: Heavy, silvery, liquid metal

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **0 - Fire** **0 - Reactivity** **DOT#:** UN 2809 **ERG Guide #:** 172 **Hazard Class:** 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. **Mercury** itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	**Mercury** reacts with ACETYLENE to form explosive *Acetylide*. **Mercury** can form explosive compounds with AMMONIA and will explode when mixed with CHLORINE DIOXIDE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and METHYL AZIDE. **Mercury** is not compatible with COMBUSTIBLE MATERIALS; METALS (such as ALUMINUM and COPPER); CALCIUM; SODIUM CARBIDE; AMINES; LITHIUM; and RUBIDIUM.

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 500 meters (1/3 mile)

Cover spill with a *Sulfur compound* to prevent vaporization and collect with a charcoal filter vacuum.

Use *Zinc* or *Copper flakes* and a flashlight to check for remaining **Mercury** after clean-up.

Mercury is very toxic to aquatic life and bioaccumulates.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Nonflammable
Vapor Density:	6.9 (air = 1)
Vapor Pressure:	0.002 mm Hg at 77°F (25°C)
Specific Gravity:	13.6 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	674°F (357°C)
Melting Point:	-38°F (-39°C)
Ionization Potential:	10.4 eV
Molecular Weight:	200.6

EXPOSURE LIMITS

NIOSH: 0.05 mg/m^3, 10-hr TWA (as **Mercury** *vapor*)
0.1 mg/m^3, Ceiling (as **Mercury**)
ACGIH: 0.025 mg/m^3, 8-hr TWA (as **Mercury**)
IDLH: 10 mg/m^3 (as **Mercury**)

The Protective Action Criteria values are:
PAC-1 = 0.3 mg/m^3
PAC-2 = 2.05 mg/m^3
PAC-3 = 4.1 mg/m^3

PROTECTIVE EQUIPMENT

Gloves: Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>8-hr breakthrough)

Coveralls: Tychem® fabrics (>8-hr breakthrough)

Respirator: >0.025 mg/m^3 - full facepiece APR with cartridges specific for **Mercury**
>0.3 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation

Inhalation: Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath
Nausea, vomiting and abdominal pain

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Right to Know Hazardous Substance Fact Sheet

Common Name: **POLYCHLORINATED BIPHENYLS**

Synonyms: Aroclor; Chlorodiphenyls; PCBs

Chemical Name: 1,1'-Biphenyl, Chloro Derivs.

Date: April 2002 Revision: November 2008

CAS Number: 1336-36-3

RTK Substance Number: 1554

DOT Number: UN 2315

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Polychlorinated Biphenyls are light yellow or colorless, thick, oily liquids. They are used in hydraulic and heat transfer liquids. They were formally used in electrical capacitators and transformers.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	2
FLAMMABILITY	-	1
REACTIVITY	-	0

CARCINOGEN
TERATOGEN
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Polychlorinated Biphenyls** are on the Right to Know Hazardous Substance List because they are cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact
- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact
- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation
- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222
CHEMTREC: 1-800-424-9300
NJDEP Hotline: 1-877-927-6337
National Response Center: 1-800-424-8802

- **Polychlorinated Biphenyls** can affect you when inhaled and by passing through the skin.
- **Polychlorinated Biphenyls** should be handled as CARCINOGENS and may be TERATOGENS. HANDLE WITH EXTREME CAUTION.
- Contact can irritate the skin and eyes.
- **Polychlorinated Biphenyls** may cause brownish pigmentation of the skin, eyes and fingernails.
- Skin contact may cause an acne-like rash (chloracne).
- Inhaling the vapors can irritate the nose, throat and lungs.
- Exposure to **Polychlorinated Biphenyls** can cause headache, nausea, vomiting, loss of weight and abdominal pain.
- High exposure can damage the nervous system causing headache, numbness, weakness, and tingling ("pins and needles) in the arms and legs.
- **Polychlorinated Biphenyls** may damage the liver.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m^3** (42% *Chlorine*) and **0.5 mg/m^3** (54% *Chlorine*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.001 mg/m^3** averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **1 mg/m^3** (42% *Chlorine*) and **0.5 mg/m^3** (54% *Chlorine*) averaged over an 8-hour workshift.

- **Polychlorinated Biphenyls** are PROBABLE CARCINOGENS and TERATOGENS in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Polychlorinated Biphenyls**:

- Contact can irritate the skin and eyes.
- Inhaling the vapors can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure to **Polychlorinated Biphenyls** can cause headache, nausea, vomiting, loss of weight and abdominal pain.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Polychlorinated Biphenyls** and can last for months or years:

Cancer Hazard
- **Polychlorinated Biphenyls** are PROBABLE CARCINOGENS in humans. There is evidence that they cause cancer of the skin, brain, and pancreas in humans and have been shown to cause liver and pituitary cancer, and leukemia, in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **Polychlorinated Biphenyls** may be TERATOGENS in humans since they are teratogens in animals.
- There is limited evidence that **Polychlorinated Biphenyls** may affect male and female fertility.

Other Effects
- **Polychlorinated Biphenyls** may cause brownish pigmentation of the skin, eyes and fingernails.
- Skin contact may cause an acne-like rash (chloracne).
- High exposure can damage the nervous system causing headache, numbness, weakness, and tingling ("pins and needles) in the arms and legs.
- **Polychlorinated Biphenyls** may damage the liver.

Medical

Medical Testing
Before beginning employment and at regular times after that, for frequent or potentially high exposures, the following are recommended:

- Liver function tests
- Exam of the skin and fingernails

If symptoms develop or overexposure is suspected, the following are recommended:

- Blood PCB levels
- Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Polychlorinated Biphenyls**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Where possible, transfer **Polychlorinated Biphenyls** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Polychlorinated Biphenyls**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Butyl, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton for gloves, and Tychem® CPF 2, SL, CPF 4 and Responder®, or the equivalent, as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.001 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **5 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **5 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Polychlorinated Biphenyls** may burn, but do not readily ignite.
- Use dry chemical, CO_2, water spray or alcohol-resistant foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Polychlorinated Dibenzofurans* and *Chlorinated Dibenzo-p-dioxins*.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Polychlorinated Biphenyls** are spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Polychlorinated Biphenyls** as HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Polychlorinated Biphenyls** you should be trained on its proper handling and storage.

- **Polychlorinated Biphenyls** are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).
- Store in tightly closed containers in a cool, well-ventilated area away from STRONG ULTRAVIOLET LIGHT and SUNLIGHT.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

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Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

NJ Health
New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **POLYCHLORINATED BIPHENYLS**

Synonyms: Aroclor; Chlorodiphenyls; PCBs
CAS No: 1336-36-3
Molecular Formula: $C_{12}H_{10-n}Cl_n$
RTK Substance No: 1554
Description: Light yellow or colorless, thick, oily liquids

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 2315 **ERG Guide #:** 171 **Hazard Class:** 9 (Miscellaneous Hazardous Materials)	**Polychlorinated Biphenyls** may burn, but do not readily ignite. Use dry chemical, CO_2, water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including *Polychlorinated Dibenzofurans* and *Chlorinated Dibenzo-p-dioxins*. Use water spray to keep fire-exposed containers cool.	**Polychlorinated Biphenyls** are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

SPILL/LEAKS

Isolation Distance:

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

Polychlorinated Biphenyls bioaccumulate and are hazardous to the environment.

PHYSICAL PROPERTIES

Flash Point:	286° to 385°F (141° to 196°C)
Auto Ignition Temp:	464°F (240°C)
Vapor Pressure:	0.001 mm Hg at 68°F (20°C)
Specific Gravity:	1.3 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	617° to 734°F (325° to 390°C)
Melting Point:	-2° to 50°F (-19° to 10°C)
Molecular Weight:	258 to 326

EXPOSURE LIMITS

OSHA:	1 mg/m^3, 8-hr TWA (42% *Chlorine*) and 0.5 mg/m^3, 8-hr TWA (54% *Chlorine*)
NIOSH:	0.001 mg/m^3, 10-hr TWA
ACGIH:	1 mg/m^3, 8-hr TWA (42% *Chlorine*) and 0.5 mg/m^3, 8-hr TWA (54% *Chlorine*)
IDLH:	5 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Butyl, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>4-hr breakthrough)
Coveralls:	Tychem® CPF 2, SL, CPF 4 and Responder® (>8-hr breakthrough)
Respirator:	>0.001 mg/m^3 - Supplied air or SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Inhalation:	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, nausea, vomiting, and abdominal pain
Chronic:	Cancer (skin, brain, pancreas) in humans

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility

Right to Know Hazardous Substance Fact Sheet

Common Name: **PETROLEUM DISTILLATES**

Synonyms: Crude Oil; Petroleum Oil

Chemical Name: Petroleum

Date: August 2011

CAS Number: 8002-05-9

RTK Substance Number: 2648

DOT Number: UN 1268

Description and Use

Petroleum Distillates are dark yellow to brown or green-black liquids with a mild *gasoline* or *kerosene*-like odor. They are a complex blend of *Hydrocarbons* used in making petroleum products.

Reasons for Citation

- **Petroleum Distillates** are on the Right to Know Hazardous Substance List because they are cited by OSHA, DOT, NIOSH and IARC.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	2	-
FLAMMABILITY	3	-
REACTIVITY	0	-

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Petroleum Distillates** can affect you when inhaled and may be absorbed through the skin.
- Contact can irritate and burn the skin and eyes.
- Inhaling **Petroleum Distillates** can irritate the nose, throat and lungs.
- **Petroleum Distillates** can affect the nervous system causing headache, dizziness, nausea, and loss of balance and coordination.
- **Petroleum Distillates** may affect the liver and kidneys.
- **Petroleum Distillates** are FLAMMABLE LIQUIDS and DANGEROUS FIRE HAZARDS.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **3,500 ppm** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **88 ppm** averaged over a 10-hour workshift and **450 ppm**, not to be exceeded during any 15-minute work period.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Petroleum Distillates**:

- Contact can irritate and burn the skin and eyes.
- Inhaling **Petroleum Distillates** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- **Petroleum Distillates** can affect the nervous system causing headache, dizziness, nausea, vomiting, blurred vision, confusion, and loss of balance and coordination. Higher levels may cause coma and death.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Petroleum Distillates** and can last for months or years:

Cancer Hazard
- While **Petroleum Distillates** have been tested, they are not classifiable as to their potential to cause cancer.

Reproductive Hazard
- There is limited evidence that **Petroleum Distillates** may affect female fertility.

Other Effects
- Prolonged or repeated exposure can cause drying and cracking of the skin with redness.
- **Petroleum Distillates** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- **Petroleum Distillates** may affect the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the REL or greater), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Chest x-ray and lung function tests
- Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Petroleum Distillates**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Petroleum Distillates** may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Petroleum Distillates**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for *Hydrocarbons* are Silver Shield®/4H®, Viton, Viton/Butyl and Barrier®.
- The recommended protective clothing materials for *Hydrocarbons* are Tychem® BR, CSM and TK; and Trellchem® HPS and VPS, or the equivalent.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect vent goggles when working with liquids that may splash, spray or mist. A face shield is also required if the liquid is severely irritating or corrosive to the skin and eyes.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **88 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **1,100 ppm** is immediately dangerous to life and health. If the possibility of exposure above **1,100 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Petroleum Distillates** are FLAMMABLE LIQUIDS.
- Use dry chemical, CO_2, alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.
- Flow or agitation may generate electrostatic charges.
- **Petroleum Distillates** may form an ignitable vapor/air mixture in closed tanks or containers.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Petroleum Distillates** are spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.
- Ventilate area of spill or leak.
- Keep **Petroleum Distillates** out of confined spaces, such as sewers, because of the possibility of an explosion.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Petroleum Distillates** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Petroleum Distillates** you should be trained on its proper handling and storage.

- **Petroleum Distillates** may react violently with OXIDIZING AGENTS (such as NITROGEN TETROXIDE, PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Petroleum Distillates** are used, handled, or stored.
- Metal containers involving the transfer of **Petroleum Distillates** should be grounded and bonded.
- Use explosion-proof electrical equipment and fittings wherever **Petroleum Distillates** are used, handled, manufactured, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Petroleum Distillates**.
- **Petroleum Distillates** may accumulate static electricity when being filled into properly grounded containers.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

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A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

NJ Health New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **PETROLEUM DISTILLATES**

Synonyms: Crude Oil; Petroleum; Petroleum Oil
CAS No: 8002-05-9
Molecular Formula: Varies
RTK Substance No: 2648
Description: Dark yellow to brown or green-black liquids with a mild *gasoline* or *kerosene* odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 1268 **ERG Guide #:** 128 **Hazard Class:** 3 (Flammable)	FLAMMABLE LIQUIDS Use dry chemical, CO_2, alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back. Flow or agitation may generate electrostatic charges. **Petroleum Distillates** may form an ignitable vapor/air mixture in closed tanks or containers.	**Petroleum Distillates** may react violently with OXIDIZING AGENTS (such as NITROGEN TETROXIDE, PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.

SPILL/LEAKS

Isolation Distance:
Spill: 50 meters (150 feet)
Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.
Bond and ground containers when transferring **Petroleum Distillates.**
Use only non-sparking tools and equipment.
Keep **Petroleum Distillates** out of confined spaces, such as sewers, because of the possibility of an explosion.
DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold:	Mild *gasoline* or *kerosene*-like
Flash Point:	-40° to -86°F (-40° to -66°C)
LEL:	1.1%
UEL:	5.9%
Vapor Pressure:	40 mm Hg at 68°F (20°C) (approximately)
Specific Gravity:	0.78 to 0.97 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	86 ° to 460°F (30° to 238°C)
Freezing Point:	-99°F (-73°C)
Molecular Weight:	98 (approximately)

EXPOSURE LIMITS

OSHA: 500 ppm, 8-hr TWA
NIOSH: 88 ppm, 10-hr TWA; 450 ppm, Ceiling (15-minute)
IDLH: 1,100 ppm
The Protective Action Criteria values are:
PAC-1 = 87.5 ppm PAC-2 = 450 ppm
PAC-3 = 1,100 ppm

PROTECTIVE EQUIPMENT

Gloves:	Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough for *Hydrocarbons*)
Coveralls:	Tychem® BR, CSM and TK; and Trellchem® HPS and VPS (>8-hr breakthrough for *Hydrocarbons*) **Use turn out gear or flash protection if ignition/fire is the greatest hazard.**
Respirator:	>88 ppm - SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns
Inhalation:	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath Headache, dizziness, confusion and loss of balance

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
Begin artificial respiration if breathing has stopped and CPR if necessary.
Transfer promptly to a medical facility.

Right to Know Hazardous Substance Fact Sheet

Common Name: **TRICHLOROETHYLENE**

Synonyms: Ethylene Trichloride; TCE; Trichloroethene

Chemical Name: Ethene, Trichloro-

Date: January 2000 Revision: December 2008

CAS Number: 79-01-6

RTK Substance Number: 1890

DOT Number: UN 1710

Description and Use

Trichloroethylene is a clear, colorless liquid with a sweet odor. It is used as a degreaser for metal parts, as a solvent and fumigant, and to make other chemicals.

- **ODOR THRESHOLD = 1.4 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- **Trichloroethylene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water. Seek medical attention.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	2
FLAMMABILITY	-	1
REACTIVITY	-	0

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Trichloroethylene** can affect you when inhaled and by passing through the skin.
- **Trichloroethylene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- Contact can irritate and burn the skin and eyes with possible eye damage.
- Exposure can cause headache, dizziness, lightheadedness, and passing out. Very high exposure can cause irregular heartbeat, which can be fatal.
- **Trichloroethylene** may cause a skin allergy.
- Repeated exposure may cause personality changes such as depression, anxiety or irritability.
- **Trichloroethylene** may damage the liver and kidneys.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift, and **200 ppm**, not to be exceeded during any 15-minute work period, and **300 ppm** as a 5-minute peak in any 2-hour work period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **10 ppm** averaged over an 8-hour workshift and **25 ppm** as a STEL (short-term exposure limit).

- **Trichloroethylene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Trichloroethylene**:

- Contact can irritate and burn the skin and eyes with possible eye damage.
- Exposure can cause headache, dizziness, lightheadedness, visual disturbances, nausea and vomiting, and passing out. Very high exposure can cause irregular heartbeat, which can be fatal.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Trichloroethylene** and can last for months or years:

Cancer Hazard
- **Trichloroethylene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes liver, kidney, and lung cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- There is limited evidence that **Trichloroethylene** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.
- There is limited evidence that **Trichloroethylene** may affect fertility and may damage the male reproductive system (including decreasing the sperm count) in animals.

Other Effects
- **Trichloroethylene** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Repeated exposure may cause personality changes such as depression, anxiety or irritability, and memory loss.
- **Trichloroethylene** may damage the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater, or significant skin contact) the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Exam of the nervous system
- Evaluation by a qualified allergist can help diagnose skin allergy.
- Urinary *Trichloroacetic Acid* level (for repeated exposures) or blood **Trichloroethylene** levels (for acute exposure)
- Special 24-48 hour EKG (Holter monitor) to observe and record abnormal heart rhythms

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Trichloroethylene**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Where possible, transfer **Trichloroethylene** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Trichloroethylene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Silver Shield®/4H®, Viton and Barrier® for gloves, and Tychem® F, BR, LV, Responder®, and TK; Zytron® 500; ONESuit® TEC; and Trellchem® HPS and VPS, or the equivalent, as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **10 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **1,000 ppm** is immediately dangerous to life and health. If the possibility of exposure above **1,000 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Trichloroethylene** may burn, but does not readily ignite.
- Use dry chemical, CO_2, water spray or alcohol-resistant foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Use water spray to reduce vapors.
- **Trichloroethylene** accumulates static charge.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Trichloroethylene** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in vermiculite, dry sand, earth, fly ash or cement powder and place into sealed containers for disposal.
- Use water spray to keep containers cool.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Trichloroethylene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Trichloroethylene** you should be trained on its proper handling and storage.

- **Trichloroethylene** will react explosively with *finely divided* or *powdered* BARIUM, BERYLLIUM, and MAGNESIUM.
- **Trichloroethylene** reacts with ACTIVE METALS (such as LITHIUM, SODIUM and TITANIUM) to cause flashing and sparks and will react with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and EPOXIDES to form spontanously flammable *Dichloroacetylene*.
- **Trichloroethylene** is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ISOCYANATES; EPICHLOROHYDRIN; ALCOHOLS; and GLYCOLS.
- Store in tightly closed containers in a cool, well-ventilated area away from COMBUSTIBLES, LIGHT and MOISTURE.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Trichloroethylene**.
- Metal containers involving the transfer of **Trichloroethylene** should be grounded and bonded as **Trichloroethylene** accumulates static charge.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

NJ Health New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **TRICHLOROETHYLENE**

Synonyms: Ethylene Trichloride; TCE; Trichloroethene
CAS No: 79-01-6
Molecular Formula: C_2HCl_3
RTK Substance No: 1890
Description: Clear, colorless liquid with a sweet, *Chloroform-like* odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 1710 **ERG Guide #:** 160 **Hazard Class:** 6.1 (Poison)	**Trichloroethylene** may burn, but does not readily ignite. Use dry chemical, CO_2, water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Use water spray to reduce vapors. **Trichloroethylene** accumulates static charge.	**Trichloroethylene** will react explosively with *finely divided* or *powdered* BARIUM, BERYLLIUM, and MAGNESIUM. **Trichloroethylene** reacts with ACTIVE METALS (such as LITHIUM, SODIUM and TITANIUM) to cause flashing and sparks. **Trichloroethylene** will react with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and EPOXIDES to form spontanously flammable *Dichloroacetylene*. **Trichloroethylene** is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ISOCYANATES; EPICHLOROHYDRIN; ALCOHOLS; and GLYCOLS.

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)
Fire: 800 meters (1/2 mile)
Absorb liquids in vermiculite, dry sand, earth, fly ash or cement powder and place into sealed containers for disposal.
DO NOT wash into sewer.
Use only non-sparking tools and equipment, especially when opening and closing containers of **Trichloroethylene**.
Metal containers should be grounded and bonded as **Trichloroethylene** accumulates static charge.
Trichloroethylene is slightly toxic to aquatic life.

PHYSICAL PROPERTIES

Odor Threshold:	1.4 ppm
Flash Point:	>200°F (93°C)
LEL:	8%
UEL:	10.5%
Auto Ignition Temp:	788°F (420°C)
Vapor Density:	4.5 (air = 1)
Vapor Pressure:	58 mm Hg at 68°F (20°C)
Specific Gravity:	1.5 (water = 1)
Water Solubility:	Slightly soluble
Boiling Point:	189°F (87°C)
Melting Point:	-99°F (-73°C)
Ionization Potential:	9.5 eV
Molecular Weight:	131.4

EXPOSURE LIMITS

ACGIH: 10 ppm, 8-hr TWA; 25 ppm, 15-min STEL
IDLH: 1,000 ppm
The Protective Action Criteria values are:
PAC-1 = 130 ppm
PAC-2 = 450 ppm
PAC-3 = 3,800 ppm

PROTECTIVE EQUIPMENT

Gloves:	Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
Coveralls:	Tychem® F, BR, LV, Responder®, and TK; Zytron® 500; ONESuit® TEC; and Trellchem® HPS and VPS (>8-hr breakthrough)
Respirator:	>10 ppm - Supplied air or SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns
Inhalation:	Headache, dizziness, lightheadedness, visual disturbances, nausea and vomiting, and passing out
Chronic:	Cancer (liver, kidney, and lung) in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
Begin artificial respiration if breathing has stopped and CPR if necessary.
Transfer promptly to a medical facility.

Right to Know Hazardous Substance Fact Sheet

Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethylene Tetrachloride; Perchloroethylene

Chemical Name: Ethene, Tetrachloro-

Date: March 2002 Revision: October 2011

CAS Number: 127-18-4

RTK Substance Number: 1810

DOT Number: UN 1897

Description and Use

Tetrachloroethylene is a clear, colorless liquid with a sweet *Ether*-like odor. It is used as a dry cleaning solvent, heat transfer medium, degreaser, solvent, and drying agent for metals.

- **ODOR THRESHOLD = 5 to 50 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- **Tetrachloroethylene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.
- Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	2
FLAMMABILITY	-	0
REACTIVITY	-	0

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE
DOES NOT BURN

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Tetrachloroethylene** can affect you when inhaled and by passing through the skin.
- **Tetrachloroethylene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- **Tetrachloroethylene** can cause reproductive damage.
- Contact can irritate and burn the skin and eyes. Prolonged or repeated exposure can cause drying and cracking of the skin with rash, redness and blisters.
- Exposure can irritate the eyes, nose and throat.
- Inhaling **Tetrachloroethylene** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- Exposure can cause headache, dizziness, lightheadedness, nausea, vomiting, and passing out.
- **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system and heart.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift, **200 ppm**, not to be exceeded during any 15-minute work period, and **300 ppm** as a maximum peak for 5-minutes during any 3-hour period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **25 ppm** averaged over an 8-hour workshift and **100 ppm** as a STEL (short-term exposure limit).

- **Tetrachloroethylene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Tetrachloroethylene**:

- Contact can irritate and burn the skin and eyes.
- Exposure can irritate the eyes, nose and throat.
- Inhaling **Tetrachloroethylene** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- Exposure can cause headache, dizziness, lightheadedness, incoordination, nausea, vomiting, and passing out.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Tetrachloroethylene** and can last for months or years:

Cancer Hazard
- **Tetrachloroethylene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes cancer of the liver, esophagus, bladder, and other types of cancer in humans. It has also been shown to cause cancer of the liver and leukemia in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **Tetrachloroethylene** may damage the developing fetus.
- **Tetrachloroethylene** may decrease fertility in males and females and may damage the male (testes) and female (ovaries) reproductive systems in animals.
- There is limited evidence that **Tetrachloroethylene** causes spontaneous abortions.

Other Effects
- Prolonged or repeated exposure can cause drying and cracking of the skin with rash, redness and blisters.
- **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system and heart

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Consider chest x-ray after acute overexposure
- Exam of the nervous system
- EKG

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Tetrachloroethylene**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Where possible, transfer **Tetrachloroethylene** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Tetrachloroethylene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for **Tetrachloroethylene** are Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier®.
- The recommended protective clothing materials for **Tetrachloroethylene** are Tychem® F, CPF3, BR, CSM and TK; and Trellchem® HPS and VPS, or the equivalent.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect vent goggles when working with liquids that may splash, spray or mist. A face shield is also required if the liquid is severely irritating or corrosive to the skin and eyes.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure to **Tetrachloroethylene**, use a NIOSH approved respirator with an organic vapor cartridge. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Tetrachloroethylene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **25 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **150 ppm** is immediately dangerous to life and health. If the possibility of exposure above **150 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Tetrachloroethylene** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.
- Ventilate area of spill or leak.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Tetrachloroethylene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Tetrachloroethylene** you should be trained on its proper handling and storage.

- **Tetrachloroethylene** reacts violently with *finely dispersed* or *finely divided* METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC).
- **Tetrachloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE.
- **Tetrachloroethylene** slowly decomposes in WATER to form acids such as *Hydrogen Chloride*.
- **Tetrachloroethylene** decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic *Hydrogen Chloride* and *Phosgene gases*.
- Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

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For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

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UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

NJ Health New Jersey Department of Health

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethene, Tetrachloro-; Ethylene Tetrachloride; Perchloroethylene
CAS No: 127-18-4
Molecular Formula: $Cl_2C=CCl_2$
RTK Substance No: 1810
Description: Clear, colorless liquid with a sweet *Ether*-like odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **0 - Fire** **0 - Reactivity** **DOT#:** UN 1897 **ERG Guide #:** 160 **Hazard Class:** 6.1 (Toxic)	Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*. Use water spray to keep fire-exposed containers cool.	**Tetrachloroethylene** reacts violently with *finely dispersed* or *finely divided* METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC). **Tetrachloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE. **Tetrachloroethylene** slowly decomposes in WATER to form acids such as *Hydrogen Chloride*. **Tetrachloroethylene** decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic *Hydrogen Chloride* and *Phosgene gases*.

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

Tetrachloroethylene is toxic to aquatic organisms and may cause long term effects on the aquatic environment.

PHYSICAL PROPERTIES

Odor Threshold:	5 to 50 ppm
Flash Point:	Noncombustible
Vapor Density:	5.8 (air = 1)
Vapor Pressure:	14 mm Hg at 68°F (20°C)
Specific Gravity:	1.62 (water = 1)
Water Solubility:	Very slightly soluble
Boiling Point:	250°F (121°C)
Freezing Point:	-2°F (-19°C)
Ionization Potential:	9.32 eV
Molecular Weight:	165.8

EXPOSURE LIMITS

OSHA:	100 ppm, 8-hr TWA; 200 ppm, Ceiling; 300 ppm, Peak
NIOSH:	Lowest feasible concentration
ACGIH:	25 ppm, 8-hr TWA; 100 ppm, STEL
IDLH:	150 ppm

The Protective Action Criteria values are:
PAC-1 = 35 ppm PAC-2 = 230 ppm
PAC-3 = 1,200 ppm

PROTECTIVE EQUIPMENT

Gloves:	Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough)
Coveralls:	Tychem® F, CPF3, BR and CSM; Trellchem® HPS and VPS (>8-hr breakthrough)
Respirator:	<25 ppm - full facepiece APR with *Organic vapor filters* Spills or Fire - SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns (skin absorbable)
Inhalation:	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema) Headache, dizziness, lightheadedness, and passing out
Chronic:	Cancer (liver, esophagus and bladder)

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Medical observation is recommended as symptoms may be delayed.

Right to Know Hazardous Substance Fact Sheet

Common Name: **VINYL CHLORIDE**

Synonyms: Chloroethylene; Monochloroethylene; VCM

Chemical Name: Ethene, Chloro-

Date: June 2001 Revision: November 2010

CAS Number: 75-01-4

RTK Substance Number: 2001

DOT Number: UN 1086

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Vinyl Chloride is a colorless gas, with a sweet odor at high concentrations, that is usually handled as a liquid under pressure. It is used to make *Polyvinyl Chloride* for pipes, wire, and cable coatings, and in furniture, automobiles, and adhesives.

- **ODOR THRESHOLD = >3,000 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- **Vinyl Chloride** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- Immerse affected part in warm water. Seek medical attention.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	4	2
FLAMMABILITY	4	4
REACTIVITY	2	2

CARCINOGEN
FLAMMABLE AND REACTIVE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Vinyl Chloride** can affect you when inhaled.
- **Vinyl Chloride** is a CARCINOGEN and MUTAGEN. HANDLE WITH EXTREME CAUTION.
- **Vinyl Chloride** can cause reproductive damage.
- Exposure to **Vinyl Chloride** can severely irritate and burn the skin and eyes with possible eye damage. Contact with the *liquid or gas* can cause frostbite.
- Inhaling **Vinyl Chloride** can irritate the nose, throat and lungs.
- **Vinyl Chloride** can cause headache, nausea, vomiting, dizziness, fatigue, weakness and confusion. Higher levels can cause lightheadedness and passing out.
- Prolonged or repeated exposure can damage the liver, nervous system and lungs.
- Repeated exposure can damage the skin (scleroderma), bones (acro-osteolysis) and blood vessels in the hands (Raynaud's Syndrome).
- **Vinyl Chloride** is FLAMMABLE and REACTIVE and a DANGEROUS FIRE and EXPLOSION HAZARD.
- EXPLOSIVE POLYMERIZATION may occur at elevated temperatures if **Vinyl Chloride** is not inhibited.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15-minute work period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **1 ppm** averaged over an 8-hour workshift.

- **Vinyl Chloride** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Vinyl Chloride**:

- Exposure to **Vinyl Chloride** can severely irritate and burn the skin and eyes with possible eye damage. Contact with the *liquid or gas* can cause frostbite.
- Inhaling **Vinyl Chloride** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- **Vinyl Chloride** can cause headache, nausea, vomiting, dizziness, fatigue, weakness and confusion. Higher levels can cause lightheadedness and passing out.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Vinyl Chloride** and can last for months or years:

Cancer Hazard
- **Vinyl Chloride** is a CARCINOGEN in humans. It has been shown to cause liver, brain, lung, and other types of cancer.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **Vinyl Chloride** may damage the developing fetus.
- There is limited evidence that **Vinyl Chloride** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.
- There is limited evidence that **Vinyl Chloride** may damage the male reproductive system (including decreasing the sperm count) and may affect male fertility.
- An excess of spontaneous abortions has been reported among spouses of workers who had been exposed to **Vinyl Chloride**.

Other Effects
- Prolonged or repeated exposure can damage the liver, nervous system and lungs.
- Repeated exposure can cause a disease called "scleroderma." This causes the skin to become very smooth, tight and shiny. It causes the bones of the fingers to erode (acro-osteolysis), and damages the blood vessels in the hands or feet (Raynaud's syndrome). This causes the fingers or toes to turn numb, pale or blue, with even mild cold exposure.

Medical

Medical Testing
Before first exposure and every 12 months thereafter, OSHA requires your employer to provide (for persons exposed to **0.5 ppm** of **Vinyl Chloride**) a work and medical history and exam which shall include:

- Liver function tests
- Chest x-ray and lung function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Exam of the nervous system
- Exam of the skin

OSHA requires your employer to provide you and your doctor with a copy of the OSHA **Vinyl Chloride** Standard (29 CFR 1910.1017).

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Vinyl Chloride**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Specific actions are required for this chemical by OSHA. Refer to the OSHA **Vinyl Chloride** Standard (29 CFR 1910.1017).
- Before entering a confined space where **Vinyl Chloride** may be present, check to make sure that an explosive concentration does not exist.
- Transfer **Vinyl Chloride** from cylinders or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Vinyl Chloride.** Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for **Vinyl Chloride** are Viton, Viton/Butyl, Silver Shield®/4H® and Barrier®.
- The recommended protective clothing materials for **Vinyl Chloride** are Tychem® BR, CSM and TK; and Trellchem® HPS and VPS or the equivalent.
- Where exposure to cold equipment, vapors, or liquid may occur, employees should be provided with *insulated* gloves and special clothing designed to prevent the freezing of body tissues.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
- Do not wear contact lenses when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **1 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- DO NOT USE CHEMICAL CARTRIDGE OR CANISTER RESPIRATORS.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Vinyl Chloride** is a FLAMMABLE AND REACTIVE GAS that can EXPLOSIVELY POLYMERIZE if not inhibited.
- DO NOT attempt to extinguish fire unless flow can be stopped. Shut off supply or let burn.
- Use dry chemical or CO_2 for small fires.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to reduce vapors and to keep containers cool.
- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.
- Flow or agitation may generate electrostatic charges.
- **Vinyl Chloride** may form an ignitable vapor/air mixture in closed tanks or containers.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Vinyl Chloride** is leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate ignition sources.
- Ventilate area of leak to disperse the gas.
- Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
- Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.
- Turn leaking cylinder with leak up to prevent escape of gas in liquid state.
- Ventilate area of spill or leak.
- Keep **Vinyl Chloride** out of confined spaces, such as sewers, because of the possibility of an explosion.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Vinyl Chloride** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Vinyl Chloride** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Vinyl Chloride** is handled, used or stored as required by the OSHA **Vinyl Chloride** Standard (29 CFR 1910.1017).
- **Vinyl Chloride** can polymerize rapidly or explosively when exposed to elevated temperatures (over 125°F (52°C)), or when exposed to AIR or LIGHT in the presence of a CATALYST.
- **Vinyl Chloride** reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- **Vinyl Chloride** is not compatible with WATER; METALS (such as COPPER, ALUMINUM, IRON and STEEL); METAL CARBIDES; and METAL ALLOYS as fires and/or explosions may occur.
- *Phenol* should be used as an inhibitor to prevent violent polymerization of **Vinyl Chloride**.
- Store in tightly closed containers in a cool, well-ventilated area away from MOISTURE, HEAT SOURCES and METALS.
- Sources of ignition, such as smoking and open flames, are prohibited where **Vinyl Chloride** is used, handled, or stored.
- Metal containers involving the transfer of **Vinyl Chloride** should be grounded and bonded.
- Use explosion-proof electrical equipment and fittings wherever **Vinyl Chloride** is used, handled, manufactured, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Vinyl Chloride**.
- **Vinyl Chloride** may accumulate static electricity.

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Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **VINYL CHLORIDE**

Synonyms: Chloroethylene; Monochloroethylene; VCM
CAS No: 75-01-4
Molecular Formula: CH_2 = CHCl
RTK Substance No: 2001

Description: Colorless gas, with a sweet odor at high concentrations, that is usually handled as a liquid under pressure

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
4 - Health **4 - Fire** **2 - Reactivity** **DOT#:** UN 1086 **ERG Guide #:** 116P **Hazard Class:** 2.1 (Flammable Gas)	FLAMMABLE AND REACTIVE GAS that can EXPLOSIVELY POLYMERIZE if not inhibited. DO NOT attempt to extinguish fire unless flow can be stopped. Shut off supply or let burn. Use dry chemical or CO_2 for small fires. POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to reduce vapors and to keep containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back. Flow or agitation may generate electrostatic charges. **Vinyl Chloride** may form an ignitable vapor/air mixture in closed tanks or containers.	**Vinyl Chloride** can polymerize rapidly or explosively when exposed to elevated temperatures (over 125°F (52°C)), or when exposed to AIR or LIGHT in the presence of a CATALYST. **Vinyl Chloride** reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). **Vinyl Chloride** is not compatible with WATER; METALS (such as COPPER, ALUMINUM, IRON and STEEL); METAL CARBIDES; and METAL ALLOYS as fires and/or explosions may occur. *Phenol* should be used as an inhibitor to prevent violent polymerization of **Vinyl Chloride.** **Vinyl Chloride** may accumulate static electricity.

SPILL/LEAKS

Isolation Distance:

Spill: 100 meters (330 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Vinyl Chloride** out of confined spaces, such as sewers, because of the possibility of an explosion.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

Use nonsparkling tools and ground and bond containers when transferring **Vinyl Chloride.**

Vinyl Chloride is hazardous to the environment.

PHYSICAL PROPERTIES

Odor Threshold:	>3,000 ppm
Flash Point:	-108°F (-78°C)
LEL:	3.6%
UEL:	33%
Auto Ignition Temp:	882°F (472°C)
Vapor Density:	2.2 (air = 1)
Vapor Pressure:	2,524 mm Hg at 68°F (20°C)
Specific Gravity:	0.9 (water = 1)
Water Solubility:	Very slightly soluble
Boiling Point:	17°F (-8.3°C)
Freezing Point:	-245° to -256°F (-154° to -160°C)
Ionization Potential:	9.99 eV
Critical Temperature:	306° to 317.3°F (152° to 158.5°C)
Molecular Weight:	62.5

EXPOSURE LIMITS

OSHA: 1 ppm, 8-hr TWA; 5 ppm, Ceiling
NIOSH: Lowest feasible concentration
ACGIH: 1 ppm, 8-hr TWA

The Protective Action Criteria values are:
PAC-1 = 250 ppm PAC-2 = 1,200 ppm
PAC-3 = 4,800 ppm

PROTECTIVE EQUIPMENT

Gloves: Insulated Viton, Viton/Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough)

Coveralls: Tychem® BR, CSM and TK; Trellchem HPS and VPS (8-hr breakthrough)
>10% of the LEL wear flash protection or turnout gear

Respirator: SCBA

HEALTH EFFECTS

Eyes: Irritation and burns, contact with *liquid* or *gas* may cause frostbite

Skin: Irritation and burns, contact with *liquid* or *gas* may cause frostbite

Inhalation: Nose, throat and lung irritation with coughing, wheezing and shortness of breath
Headache, dizziness, lightheadedness and passing out

Chronic: Cancer (liver, brain, and lung) in humans

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Immerse affected part in warm water. Seek medical attention.

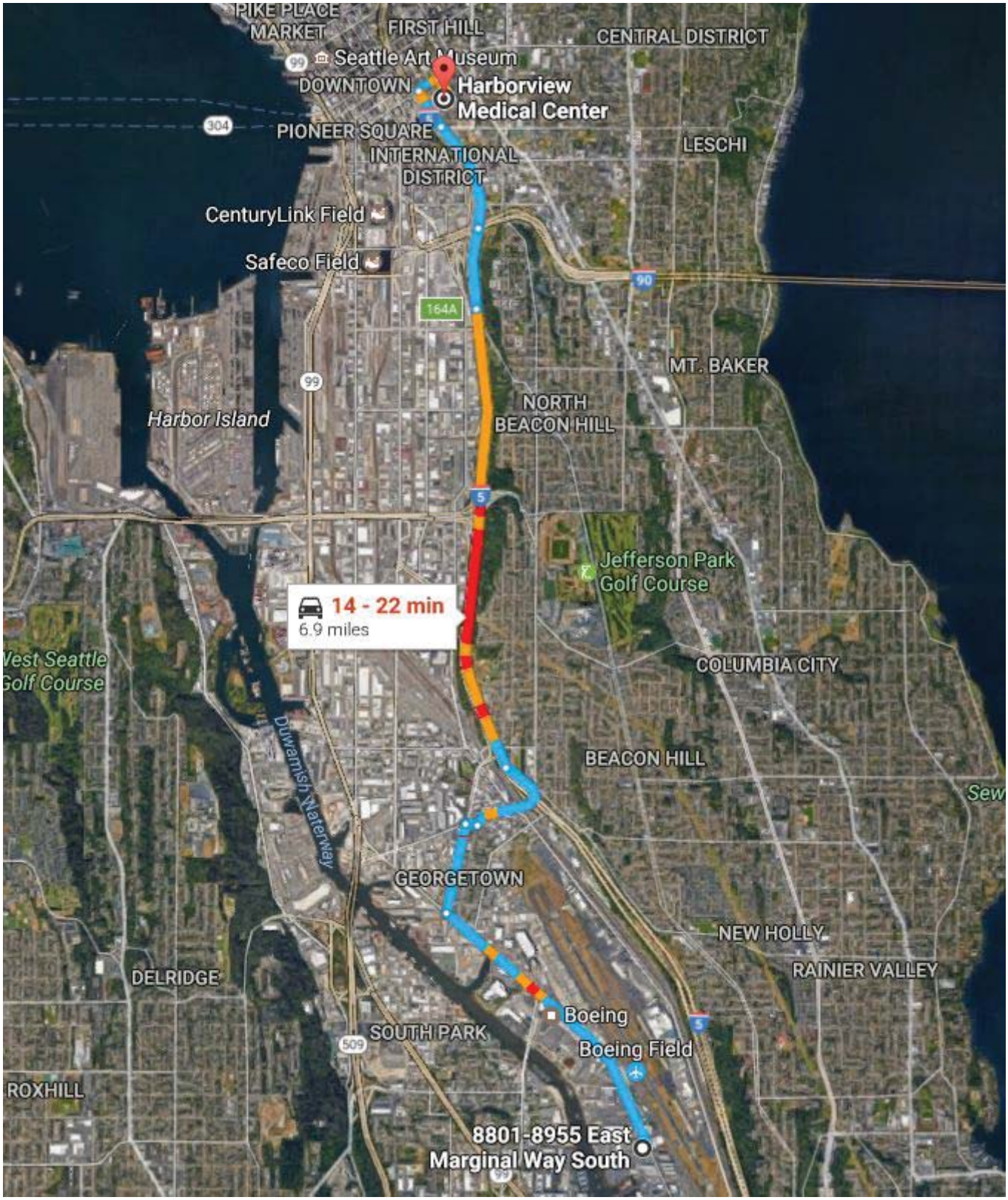
Begin artificial respiration if breathing has stopped and CPR if necessary.

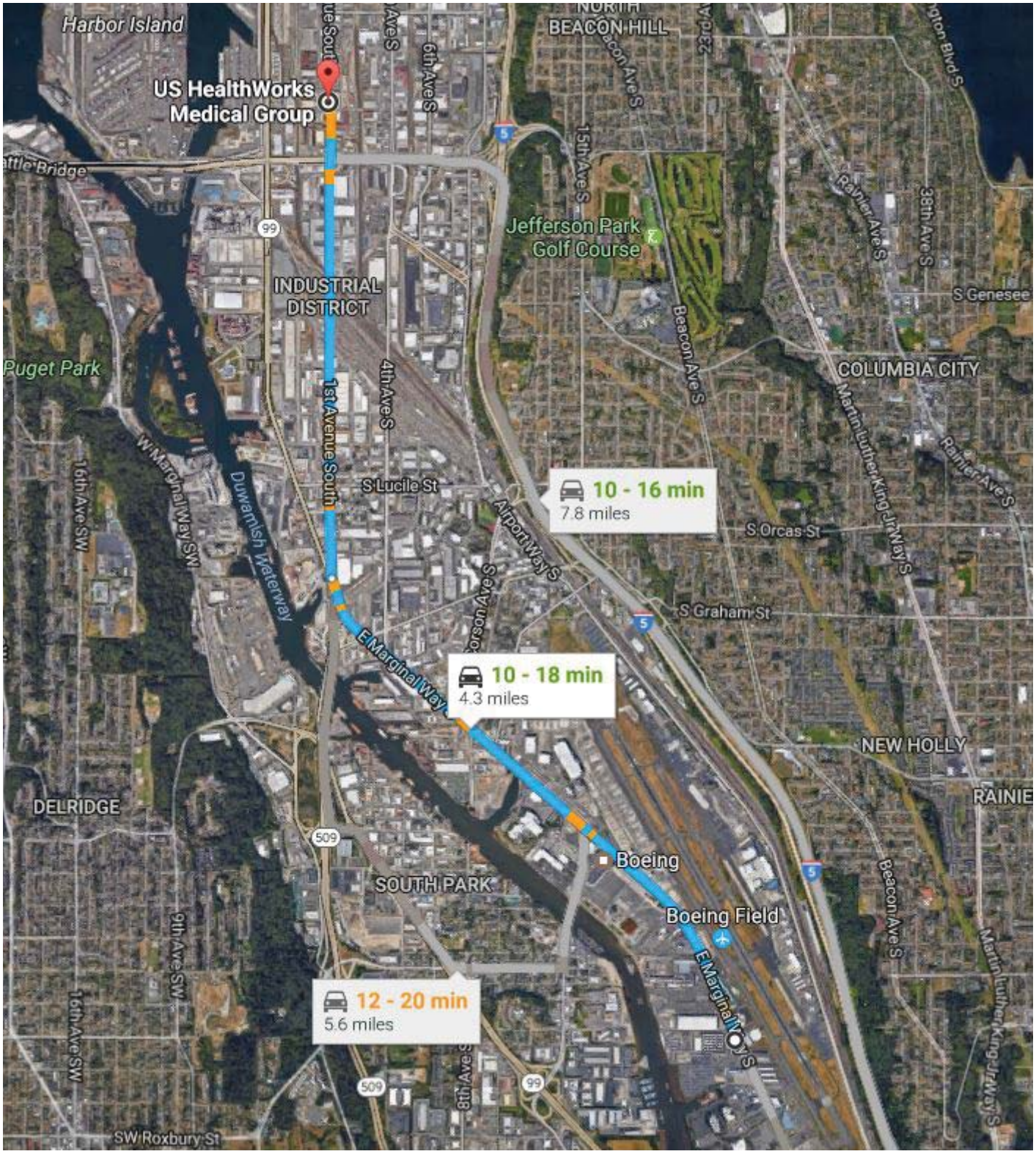
Transfer promptly to a medical facility.

ATTACHMENT D: SITE MAPS TO NEAREST WALK-IN CLINIC AND HOSPITAL

Attachment D

Site Maps to Nearest Walk-In Clinic and Hospital


PIKE PLACE MARKET
FIRST HILL
CENTRAL DISTRICT
Seattle Art Museum
DOWNTOWN
Harborview Medical Center
PIONEER SQUARE
INTERNATIONAL DISTRICT
LESCHI
CenturyLink Field
Safeco Field
164A
MT. BAKER
Harbor Island
NORTH BEACON HILL
Jefferson Park Golf Course
14 - 22 min
6.9 miles
COLUMBIA CITY
Duwamish Waterway
BEACON HILL
GEORGETOWN
NEW HOLLY
RAINIER VALLEY
DELRIDGE
Boeing
SOUTH PARK
Boeing Field
ROXHILL
8801-8955 East Marginal Way South


US HealthWorks Medical Group
10 - 16 min
7.8 miles
10 - 18 min
4.3 miles
12 - 20 min
5.6 miles
Harbor Island
INDUSTRIAL DISTRICT
Jefferson Park Golf Course
NORTH BEACON HILL
COLUMBIA CITY
NEW HOLLY
DELRIDGE
SOUTH PARK
Boeing
Boeing Field
Puget Park
1st Avenue South
4th Ave S
6th Ave S
15th Ave S
Beacon Ave S
Rainier Ave S
S Lucile St
S Orcas St
S Graham St
Airport Way S
E Marginal Way
W Marginal Way SW
Duwamish Waterway
16th Ave SW
9th Ave SW
16th Ave SW
SW Roxbury St
Martin Luther King Jr Way S
S Genesee
38th Ave S
99
509
5